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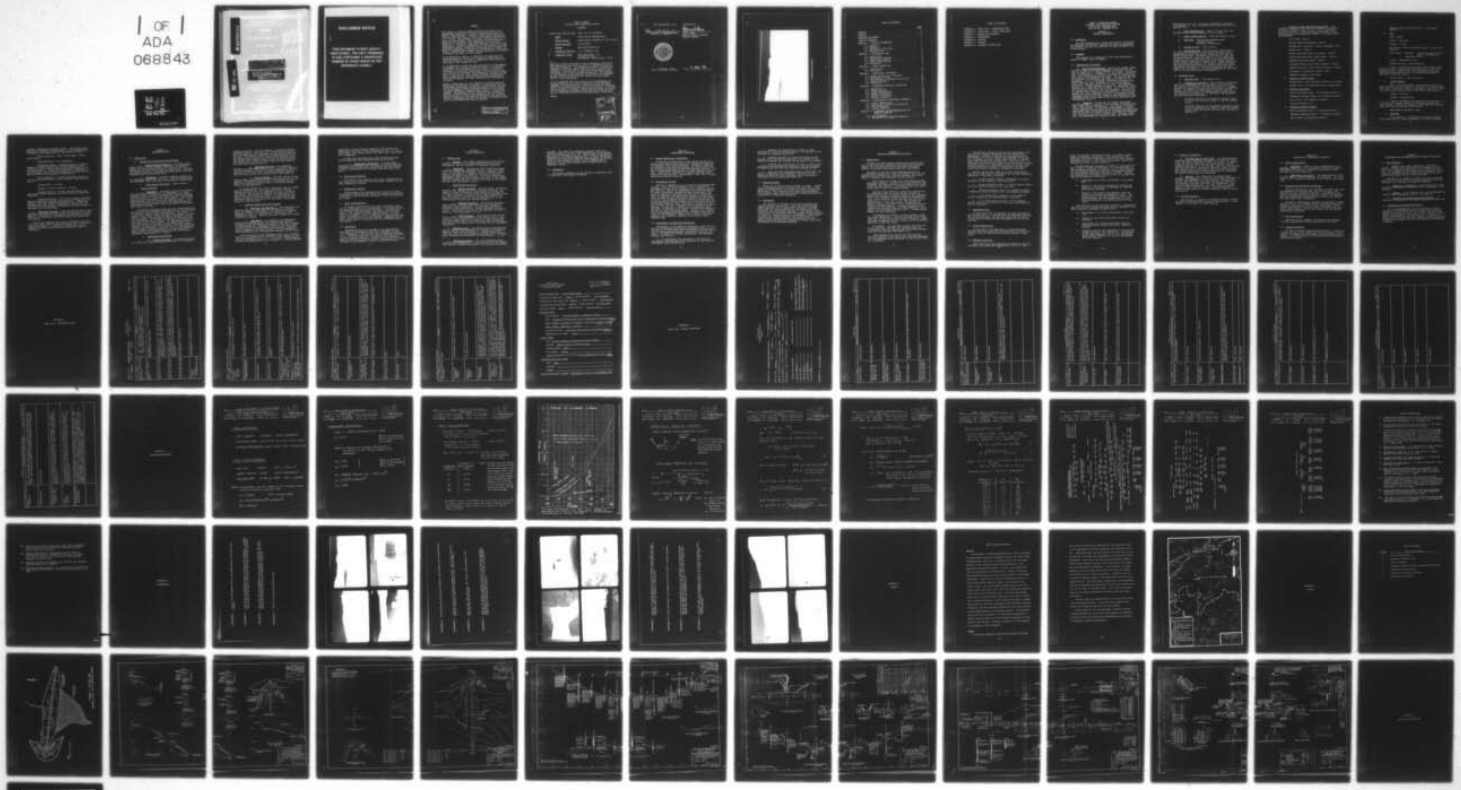

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National Dam Inspection Program. Griffin Dam (NDI PA-Ø35, PA455), Susquehanna River Basin, West Beechwood Run, Tioga County, Pennsylvania. Phase I Inspection Report.

15

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE I REPORT
National Dam Inspection Program

ABSTRACT

PA-455 Dam (Griffin Dam): NDS I.D. No. PA-00035

Owner:	Tioga County Commissioners
State Located:	Pennsylvania (PennDER I.D. No. 59-62)
County Located:	Tioga County
Stream:	West Beech Woods Run
Inspection Date(s):	6 & 7 November 1978
Inspection Team:	GAI Consultants, Inc. 570 Beatty Road Monroeville, Pennsylvania 15146

Based on a visual inspection, past performance, and available engineering data, the facility is considered to be in excellent condition. The emergency spillway is capable of discharging the peak inflow resulting from a storm of PMF intensity, as determined by the Corps of Engineers (HEC-1) procedures, and is thus considered adequate. The adequacy of the seepage control measures, which could be considered minimal, should be observed and evaluated during higher pool or flood conditions.

It is recommended that the operation and maintenance procedures listed in the owners' operation and maintenance agreement be formalized into a manual and kept available to ensure the continued proper care of the facility. Provision should be made to include a formal warning system to provide for and establish procedures to protect the lives and property of downstream residents during emergency conditions.

BMM/jh

GAI Consultants, Inc.

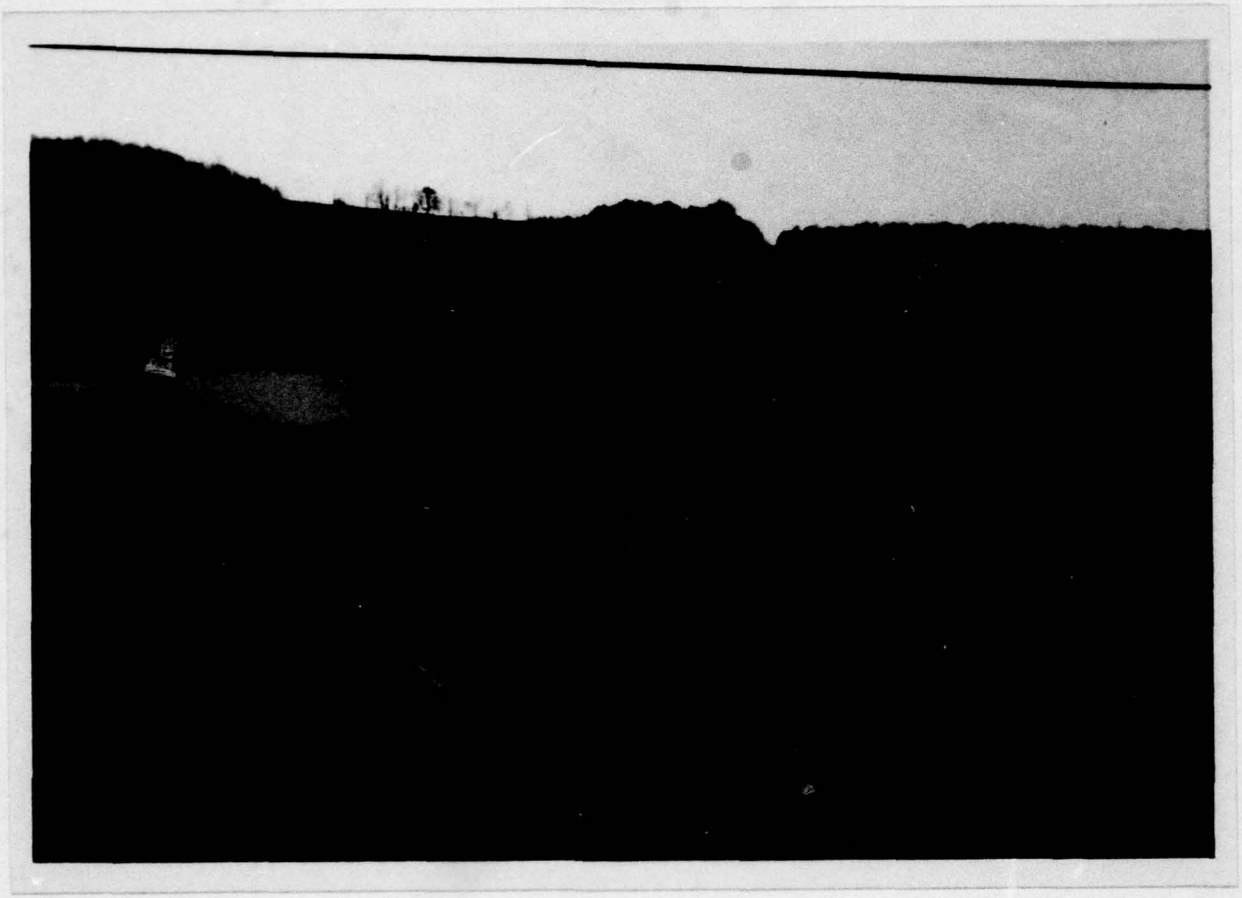
Bernard M. Mihalcin, P.E.

Date 5 Feb 1979

Approved by:

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

Date 3 Mar 79



OVERVIEW PHOTOGRAPH

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PA-455 DAM (GRIFFIN DAM)
NDI# PA-035, PENNDER# 59-62

SECTION 1
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. PA-455 Dam, locally known as Griffin Dam, is an earth embankment approximately 850 feet in length with a maximum height of 37 feet. The structure is essentially a standard U. S. Department of Agriculture, Soil Conservation Service design and is equipped with both service and emergency spillways. The service spillway is located on the upstream face near the center of the embankment. It is a two-stage, reinforced concrete, drop inlet, vertical riser connected to a 30-inch diameter, horizontal, concrete conduit at its base. The emergency spillway is a vegetated earth channel of trapezoidal cross-section with a base width of 50 feet. It is cut into natural ground and located at the left abutment. The facility is provided with a pond drain consisting of a 32-foot long section of 15-inch diameter B.C.C.M.P. (bituminous-coated corrugated metal pipe) with intake at the upstream toe and discharge outlet at the base of the service spillway riser (see Figures 6 and 7).

b. Location. PA-455 Dam is located across West Beech Woods Run, a tributary to Mill Creek, in Clymer Township, Tioga County, Pennsylvania. The village of Sabinsville, Pennsylvania, is situated approximately 1.5 miles downstream along Pennsylvania Route 349 while Beechwood Lake Dam (PA-454 Dam) is located within a neighboring watershed just one mile to the east of PA-455 Dam. The dam, reservoir, and watershed are contained within the Sabinsville,

Pennsylvania, U.S.G.S. 7.5 minute topographic quadrangle (see Appendix G). The coordinates of the dam are N41° 51.2' and W77° 32.0'.

c. Size Classification. Small (37 feet high, 120 acre-feet total storage capacity to top of dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Tioga County Commissioners
118 Main Street
Wellsboro, Pennsylvania

f. Purpose of Dam. Flood control.

g. Historical Data. PA-455 Dam was constructed as the second in a system of three dams in the Mill Creek Watershed including dams PA-454 (Beechwood Lake Dam) and PA-456 (Eberle Dam). Designed by the U.S.D.A., Soil Conservation Service, under the authority of the "Watershed Protection and Fire Prevention Act," the project was completed ahead of schedule in August 1963. Annual inspection reports dated 1964 through 1978 indicate the dam has been well maintained throughout its 15-year history and that no significant problems or recurring deficiencies are associated with the facility. No major modifications have been made to the structure since its completion.

1.3 Pertinent Data.

a. Drainage Area. 0.48 square miles.

b. Discharge at Dam Site. Daily records of reservoir levels and discharges are not recorded at this facility. The owner is obligated by contract with the SCS to inspect the facility after every major storm and report on possible damage. An estimate of high water is usually included. Discussions with a local SCS representative present during the inspection indicated that to this date, the emergency spillway has never discharged.

Discharge Capacity of the Service Spillway (pool at top of dam elevation 1824.0) ≈ 120 cfs (design value).

Discharge Capacity of the Emergency Spillway (pool at top of dam elevation 1824.0) ≈ 2450 cfs (design value); 2406 cfs (as per calculations contained in Appendix C).

c. Elevation (feet above mean sea level). The elevations listed in this section are based on available "as-built" drawings by the U.S.D.A., Soil Conservation Service dated 5-63. These elevations have been roughly verified by field measurements; however, no formal survey was performed.

Top of Dam ≈ 1824.0.

Maximum Design High Water ≈ 1821.9.

Maximum Pool of Record ≈ 1811.5 (September 1975).

Normal Pool ≈ 1803.5.

Service Spillway Crest (low stage) ≈ 1803.5.

Service Spillway Crest (high state) ≈ 1812.0.

Emergency Spillway Crest ≈ 1818.5.

Upstream Portal Invert Outlet Conduit ≈ 1791.0.

Downstream Portal Invert Outlet Conduit ≈ 1786.6.

Streambed at Centerline of Dam ≈ 1790.

Maximum Tailwater - Not known.

d. Reservoir Length (feet).

Maximum Pool ≈ 1000 (elevation 1824.0 top of dam).

Normal Pool ≈ 350 (elevation 1803.5 normal pool).

e. Storage (acre-feet).

Service Spillway Crest ≈ 10 (elevation 1803.5).

Emergency Spillway Crest ≈ 80 (elevation 1818.5).

Top of Dam ≈ 120 (elevation 1824.0).

Design Surcharge ≈ 40.

f. Reservoir Surface (acres).

Service Spillway Crest ≈ 2 (elevation 1803.5).

Emergency Spillway Crest ≈ 7 (elevation 1818.5).

Top of Dam ≈ 10 (elevation 1824.0).

Maximum Design High Water Pool ≈ 9 (elevation 1821.9).

g. Dam.

Type - Earth.

Length ≈ 850 feet.

Height ≈ 37 feet.

Top Width - 20 feet (measured value); 14 feet (see Figure 6).

Side Slopes - upstream: 2.5H:1V (measured value); 3H:1V (see Figure 3)
downstream: 2H:1V

Zoning - Homogeneous earth.

Impervious Core - None indicated.

Cutoff - Information available from PennDER files indicates that a 12-foot wide cutoff trench with 1:1 side slopes has been provided along the embankment centerline. The base of the trench is set at an approximate depth of four feet across the valley.

Grout Curtain - None indicated.

h. Outlet Conduit.

Type - 30-inch diameter, reinforced concrete, low level conduit with its intake at the base of the service spillway riser. The outlet conduit is designed to discharge flow from the service spillway and/or pond drain (see Figure 6).

Length ≈ 169 feet.

Closure - Uncontrolled.

Access - Located at the base of the service spillway riser, the outlet conduit is accessible through the riser itself. However, no ladder or other means of reaching the riser base is provided by the design.

Regulating Facilities - None.

i. Spillway.

Type (service) - Two-stage, reinforced concrete, drop inlet, vertical riser connected to a 30-inch diameter,

concrete, horizontal discharge conduit. The conduit runs beneath the embankment perpendicular to the centerline and discharges at the downstream toe (see Figures 6 and 7).

Crest Elevations - 1803.5 (low stage); 1812.0 (high stage).

Upstream Channel - Not applicable.

Downstream Channel - Discharge from the service spillway is passed through the 30-inch diameter outlet conduit and into a small trapezoidal-shaped plunge pool at the downstream toe. Beyond the plunge pool, discharge is channeled into a small unlined stream that carries the flow past the farms and residences of Sabinsville.

Type (emergency) - Unlined vegetated channel cut into natural ground along the left abutment (see Figures 3 and 4).

Channel Width ≈ 50 feet.

Breadth of Control Section ≈ 20 feet.

Upstream Channel - Curved, unlined channel with two percent slope away from the control section toward the reservoir.

Downstream Channel - 50 feet of channel continues past the emergency spillway control section, sloping at 2.5 percent toward the downstream embankment toe. Beyond the emergency spillway channel, discharge is passed over the grass-covered left abutment hillside and into the stream at the base of the valley below.

j. Regulating Outlets. Flows through the service and emergency spillways are uncontrolled and regulated in accordance with the hydraulic principals incorporated into their designs. No mechanical regulating devices are associated with either.

The 15-inch diameter pond drain is sealed at both the inlet and outlet ends by two steel plates that are bolted in place (see Figure 7). Presently the pond drain is not operable and would require special attention to make it functional.

SECTION 2
ENGINEERING DATA

2.1 Design Data.

a. Design Data Availability and Sources.

1. Hydrology and Hydraulics. No formal design reports are available; however, hydrologic and hydraulic design data are contained within the files of the Soil Conservation Service at Harrisburg, Pennsylvania. Included are stage-storage and elevation-discharge curves along with hydrograph and flood-routing data.

2. Embankment. No formal reports relative to the embankment design are available. Available design data are contained within SCS files at Harrisburg, Pennsylvania.

3. Appurtenant Structures. Same as above.

b. Design Features.

1. Embankment. Available construction drawings and design data indicate that the embankment is a homogeneous earthfill structure constructed of borrow material consisting mainly of silty and clayey gravels. The embankment has been constructed with side slopes of 2H:1V on the downstream face and 2.5H:1V on the upstream slope. A 9.5-foot wide berm has been provided on the upstream face at approximate elevation 1803.5 while the width of the embankment crest is 20 feet.

A foundation drainage system has been incorporated into the design of the embankment reportedly due to the closeness of the water table to the ground surface. The system consists of a trench drain, as detailed in Figure 5, 8 feet wide by 4 feet deep, backfilled with a specified granular filter material. The trench is located at the base of the fill and extends for 210 feet to the left and 200 feet to the right of the outlet conduit. In approximately half of the trench drain or 110 feet to each side of the outlet conduit, a 6-inch perforated B.C.C.M.P. has been installed to facilitate drainage. A 12-inch layer of rock riprap has been provided at the downstream toe in the area where the outlet conduit and drainage pipes protrude through the embankment (see Figures 3, 5, and 6).

2. Appurtenant Structures.

a) Service Spillway. The service spillway is a drop inlet type structure consisting of a reinforced

concrete riser and a 30-inch diameter, reinforced concrete, discharge conduit. The riser is a 25-foot high structure and is located along the upstream toe between Stations 4+00 and 5+00. The intake orifice (first stage opening) is set at elevation 1803.5 and is two feet wide by one foot high. The second stage overflow crest is set at elevation 1812.0 and consists of 7.5 feet of crest length on both sides of the riser (see Figures 6 and 7).

b) Emergency Spillway. The emergency spillway is a trapezoidal channel cut into natural ground on the left abutment. The control section measures 50 feet in length and is 20 feet wide. Available drawings indicate that the crest is set at elevation 1818.5 (see Figure 3).

c) Outlet Conduit. The main section of the outlet conduit consists of approximately 169 feet of 30-inch diameter, reinforced concrete pipe. It extends from the base of the service spillway riser to the stream channel beyond the downstream toe.

A 15-inch diameter B.C.C.M.P. pond drain has its intake near the upstream toe. An 8-foot perforated, vertical standing section of 30-inch diameter B.C.C.M.P. serves as the intake. The conduit is designed to discharge at the base of the service spillway riser. Two steel plates are bolted in place at both the inlet and outlet ends of the pond drain conduit and provide the only means of drawdown control at this facility.

c. Specific Design Data and Criteria.

1. Hydrology and Hydraulics. The hydrologic and hydraulic design of this facility was based on criteria, data, and methods established in the "National Engineering Handbook" of the U. S. Department of Agriculture, Soil Conservation Service. Specific data and criteria are listed in Section 5, herein.

2. Embankment. All aspects of the embankment design were prepared by the Soil Conservation Service. Available design information includes all the basic elements of earth dam design. Embankment materials and local soils classifications, moisture-density relationship, consolidation, permeability and shear strength are all discussed in various memoranda and correspondence contained in SCS files.

Slope stability of the embankment alone, for a 37-foot high fill was checked using a Swedish Circle Method and soil strength parameters of $\emptyset = 27°$, $c = 250$ psf. Minimum safety factors were determined for full drawdown on a 3H:1V upstream

slope with a 10-foot berm at elevation 1803 and for the downstream slope with a drain effective at c/b = 0.6, on a 2H:1V slope. The safety factors for these cases were found to be acceptable.

No data were available that could confirm the above design parameters were indeed attained in the field.

3. Appurtenant Structures. The appurtenant structures incorporated into the facility for the most part resemble proven standard Soil Conservation Service designs. No design calculations are available from SCS files, however.

2.2 Construction Records.

No records of any aspect of the actual construction of this facility are available from the owner, PennDER, or the Soil Conservation Service.

2.3 Operational Records.

Conversations with representatives of the local Soil Conservation Service present during the inspection indicated no records of the day-to-day operation of this facility are maintained.

2.4 Other Investigations.

No formal investigations have been performed on this facility subsequent to its construction. In accordance with the "Operation and Maintenance Agreement," the owner performs a site inspection once a year and after each major storm in the company of an SCS representative. A brief report is prepared, a copy of which can be obtained from the owner, local SCS office, or the PennDER. Remedial work is usually performed in accordance with the recommendations of this report.

2.5 Evaluation.

Engineering data were provided by the Pennsylvania Department of Environmental Resources (PennDER) and the U. S. Department of Agriculture, Soil Conservation Service (SCS). Sufficient data are available to indicate the structure was formally designed in accordance with accepted modern engineering practice; however, provisions for internal drainage of the embankment could be considered minimal.

SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of this project indicates the dam and its appurtenances require little maintenance, and are currently in excellent condition.

b. Embankment. Observations made during the visual inspection reveal the embankment to be in excellent condition. No evidence of sloughing, erosion, seepage, animal burrows, settlements in excess of one foot, or signs of maintenance neglect were observed. The grass covering the embankment slopes had been recently cut prior to the inspection and afforded the field team a clear view of the entire facility (see Photographs 1 and 2).

c. Appurtenant Structures.

1. Service Spillway. The drop inlet, reinforced concrete riser appears to be in excellent condition. No cracks or signs of weathering were observed in either the interior or exterior of the structure (see Photographs 4 and 6). The trash rack attached to the upstream face of the riser did display areas of surface corrosion but is considered minor at this time (see Photograph 7).

2. Emergency Spillway. The unlined vegetated earth channel spillway located at the left abutment has reportedly never discharged. Its dimensions generally conform to those shown on the contract drawings (see Figure 4). The overall condition of the emergency spillway is excellent (see Photographs 9 and 10).

3. Outlet Conduit. The visible portion of the outlet conduit (see Photograph 8) was found to be in good condition. Minor spalling at the end of the concrete conduit has exposed some of its welded wire mesh reinforcing. The extent of the deterioration is slight and not considered significant.

d. Reservoir Area. The general area surrounding the pond is characterized primarily by farmlands of gentle and moderate slopes (see Photograph 3). Wooded areas exist along the left and right abutment hillsides and at isolated areas throughout the watershed (see Photographs 1, 2, and 3).

e. Downstream Channel. The area immediately downstream of the embankment is a broad valley with characteristics similar to those found within the watershed surrounding

the pond. The valley is occupied by several farms the closest of which is within a few hundred feet of the embankment (see Photographs 9 and 12). The village of Sabinsville, Pennsylvania, is located approximately 1.5 miles downstream. According to Tioga County records, approximately 150 persons reside in this general vicinity; and it appears that at least 30 to 40 of these persons could be affected by an embankment breach.

3.2 Evaluation.

The overall condition of the facility is excellent with no significant deficiencies observed.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Normal Operational Procedures.

PA-455 Dam is essentially a self-regulating facility. Excess inflow passes down through the service spillway and is discharged into the stream below. Inflows in excess of the capacity of the service spillway are stored until they can be safely discharged through the emergency spillway. To date, the emergency spillway has not been required to function. There are no regulating or operable devices associated with the facility. Consequently, there are no formal operating procedures required.

4.2 Maintenance of Dam.

The dam is designed to be a virtually maintenance-free facility. Any routine maintenance that is required is performed by Tioga County personnel or by separate contract and often as a result of recommendations by SCS inspectors. No formal maintenance program has been established. The owner is required to maintain the facility in accordance with the "Operation and Maintenance Agreement" dated June 7, 1962, between the Soil Conservation Service and the County of Tioga. The agreement contains provisions requiring the annual inspection and maintenance of the entire facility and surrounding reservoir area. The owner is required to prepare a report for each inspection and to furnish one copy to the SCS. In addition, a record of all maintenance work performed is required to be readily available for review by the SCS or other authorized agency. Copies of the "Operation and Maintenance Agreement" are available from both the owner and the Wellsboro, Pennsylvania, office of the SCS. Copies of the inspection reports are contained within PennDER files.

4.3 Maintenance of Operating Facilities.

Maintenance of the operating facilities, that is, the service and emergency spillways, embankment drains, etc., is carried out in accordance with the provisions of the "Operation and Maintenance Agreement" discussed in Section 4.2 above. In addition to routine maintenance, the agreement requires the owner to:

a. Be responsible for operation of the works of improvement simultaneously with acceptance of the works of improvement from the contractor.

b. Prohibit the installation of gates or other obstructions of any kind being placed in any portion of the principal or emergency spillway(s).

c. Prohibit any works to raise any portion of the spillway above the planned elevation or to deflect or decrease the planned flow through the spillways in any manner.

d. Prohibit the installation of dikes or other structures which may decrease the capacity of the flood channel or deflect the flow from the constructed channel bottom.

e. Take all other necessary steps to insure that the works of improvement are permitted to function in the manner for which they were designed, and are operated in accordance with any applicable state law.

4.4 Warning Systems.

There are no formal warning systems in effect. According to representatives of the owner and local SCS, a high degree of communication and cooperation exists between the two parties. This coupled with an active and dependable Civil Defense Corps reportedly provides adequate warning and protection for downstream residents.

4.5 Evaluation.

The facility is designed to be self-regulating and requires minimal maintenance. There are no established formal operation and/or maintenance procedures; however, provisions for such procedures are contained within the "Operation and Maintenance Agreement." The general condition of facility indicates that the present informal program is adequate. Formal manuals are recommended, nevertheless, to ensure the continued proper care of the facility. A formal warning system should be incorporated into the manuals providing detailed procedures to protect the lives and property of downstream residents.

SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

Although no formal design reports are available relative to this facility, sufficient hydrologic and hydraulic design data are contained within SCS files (Harrisburg office) to evaluate the design procedures and methods.

According to the "Mill Creek Watershed Work Plan" (a preliminary feasibility study) dated March 1960, the SCS employed the following data, sources, methods, and procedures to determine the hydrologic design criteria.

> "Mill Creek was divided into five damage and four hydrologic reaches. A total of 16 valley sections were surveyed, and stage-discharge relationships were established for each section. A control section was selected for each of the five damage reaches.
>
> Specific flood frequency curves were prepared for the Cowanesque River by a statistical analysis of stream flow records of gauges located on the Cowanesque River and on streams of similar physical characteristics. Peak discharge versus drainage area curves were prepared for 1, 2, 5, 10, 20, 50, and 100 year frequency events. From these curves, discharges for specific drainage areas for all of the above-mentioned frequencies were obtained. A damage frequency relationship was developed from the stage-discharge, stage-damage, and discharge-frequency curves. Average annual damage was then determined.
>
> To determine the effect of land treatment in the Mill Creek Watershed, a curve was plotted with percent reduction in peak flood runoff versus frequency. These data were transposed from the analysis of the Conaserago Watershed in New York state.
>
> To determine the reduction in peak flood flow due to the structural program, the discharge from the uncontrolled area was computed and the maximum release rate from the structure was added to it.
>
> These methods were current Soil Conservation Service procedure at the time a work plan was developed for the Cowanesque River Watershed, of which Mill Creek is a tributary."

The hydraulic design of the facility was based on the then current criteria established by the Pennsylvania Department of Forests and Waters known popularly as the Pennsylvania "C" curve. Design data indicates PA-455 Dam has a drainage area that covers approximately 0.6 square miles (GAI calculations indicate D.A. = 0.48 sq. mi.). A drainage area of this size required the dam to have spillway facilities capable of discharging a flow of 894 cfs. The original design was capable of discharging the required inflow while still providing a freeboard of two feet.

Several factors were used by the Soil Conservation Service in their design to determine the various structural elevations. They were as follows:

a. 50-year sediment deposit (determines the invert elevation of the orifice in the riser unit).

b. 10-year frequency storm - 1 inch of runoff (determines the crest elevation of the riser unit).

c. 100-year frequency storm - 3.4 inches of runoff (determines the crest elevation of the emergency spillway).

d. 1.0 x 6-hour point rainfall - 7.44 inches of runoff (determines the maximum design high water).

e. 2.5 x 6-hour point rainfall - 9.53 inches of runoff (sets the top elevation of the dam and provides two feet of freeboard).

5.2 Experience Data.

No data pertaining to emergency spillway performance are available as it is reported that the emergency spillway has never discharged. The general appearance of the facility indicates adequate past performance of the service spillway.

5.3 Visual Observations.

On the date of the inspection, no conditions were observed that would indicate the appurtenant structures of the dam could not operate satisfactorily during a flood event.

5.4 Method of Analysis.

The facility has been analyzed in accordance with the procedures and guidelines established by the U. S. Army

Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed utilizing a modified version of the HEC-1 program developed by the U. S. Army Corps of Engineers, Hydrologic Engineering Center, Davis, California.

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam; and (2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge, time of the peak discharge, and the maximum stage of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequences resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

a. Development of an inflow hydrograph to the reservoir.

b. Routing of the inflow hydrograph through the reservoir.

c. Development of a failure hydrograph based on specified breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph to desired downstream locations. The results provide estimates of the peak discharge, time to peak and maximum water surface elevations of failure hydrographs for each location.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams, for Phase I Investigations, the SDF for this facility ranges between 1/2 PMF (probable maximum flood) and the PMF. That is, based on the relative size (small) and hazard potential (high) of PA-455 Dam, the facility is required to have sufficient spillway and storage capacities to safely discharge the recommended SDF without overtopping the embankment.

b. Results. The results of the modified HEC-1 analysis (see Appendix C) indicates that under conditions of the PMF, the embankment will not overtop. The peak PMF inflow (1955 cfs) does not exceed the maximum capacity of the emergency spillway (2400 cfs) and consequently, the storm is safely discharged. The pool rises to a maximum elevation 1823.2 before receding. This corresponds to several inches below the settled embankment crest at elevation 1824.0.

5.6 Spillway Adequacy.

The spillway is capable of discharging and/or storing the inflow resulting from a storm of PMF intensity. Consequently, the spillway is deemed adequate.

SECTION 6
EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment appears to be in excellent structural condition. No evidence of seepage or structural deficiencies were detected during the inspection.

b. Appurtenant Structures. The appurtenances of this facility appear to be structurally well designed. All were found to be in excellent condition at the time of the inspection.

6.2 Design and Construction Techniques.

Available design data and information obtained from SCS and PennDER files indicate that for the most part, the facility has been adequatley designed in conformance with modern accepted engineering practice. Many of its features have been repeatedly incorporated into similar SCS designs and have proven their reliability.

Although no construction records are available, conversations with Mr. Don Lindsey (District Conservationist, SCS, Wellsboro, Pennsylvania, office) who represented the SCS during construction, revealed nothing of unusual note that would create suspicion as to the integrity of the applied construction techniques.

6.3 Past Performance.

According to Mr. Lindsey, the facility has operated virtually problem-free and has functioned as designed.

6.4 Seismic Stability.

The dam is located within Seismic Zone No. 1, and it is thought that the static stability of the structure is sufficient to withstand minor earthquake-induced dynamic forces. However, no investigations or calculations were performed to confirm this belief.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The visual inspection, operational history, and available engineering data suggest that the facility is adequately maintained and in excellent condition. The adequacy of the seepage control measures, which could be considered minimal, should be observed and evaluated during higher pool or flood conditions.

The project is capable of passing the flow resulting from a storm of PMF magnitude without overtopping the dam; therefore, the spillway is considered adequate.

b. Adequacy of Information. The available data are considered sufficient to make an accurate assessment of the facility.

c. Urgency. It is suggested that the recommendations listed below be implemented as soon as possible.

d. Necessity for Additional Investigations. No additional investigations are deemed necessary at this time.

7.2 Recommendations/Remedial Measures.

It is recommended that the owner develop a formal operation and maintenance manual to ensure the continued proper care of the facility. The current "Operation and Maintenance Agreement" pertaining to this facility could be used as guidelines for any such manuals. In addition, a formal warning system should be included providing detailed procedures to protect the lives and property of downstream residents.

APPENDIX A

CHECK LIST - ENGINEERING DATA

NAME OF DAM: PA-455 (Griffin Dam)

NDI#: PA-035 PENNDER# : 59-62

CHECK LIST
ENGINEERING DATA
PHASE I

ITEM	REMARKS NDI# PA -035
PERSONS INTERVIEWED AND TITLE	1. SCS - Don Lindsey (District Conservationist). 2. SCS - Dennis Carmin (Area Engineer). 3. County Planning Director - Charles Balleine.
REGIONAL VICINITY MAP	See Appendix G. U.S.G.S. 7.5 minute topographic quadrangle, Sabinsville, Pennsylvania (dated 1969).
CONSTRUCTION HISTORY	Completed in 1963, the facility was designed by the U.S.D.A., Soil Conservation Service (SCS) and was constructed by Eisert Construction Company of Ithaca, New York. No records of any aspect of the construction are available.
AVAILABLE DRAWINGS	A complete set of "as-built" drawings by the SCS dated 5-63 are available from the owner and the SCS at Harrisburg and Wellsboro. Drawings available from PennDER are not marked "as-built" but nevertheless appear to be identical.
TYPICAL DAM SECTIONS	(See Appendix F, Figure 6)
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	(See Appendix F, Figures 3,5, and 6)

ITEM	REMARKS NDI# PA - 035
SPILLWAY: PLAN SECTION DETAILS	(See Appendix F, Figures 3,4, and 6)
OPERATING EQUIPMENT PLANS AND DETAILS	(See Appendix F, Figures 6 and 7)
DESIGN REPORTS	No formal design reports are available. Design information is obtainable from the SCS Harrisburg office.
GEOLOGY REPORTS	Geological data and information available from the SCS Harrisburg office.
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	No complete analyses are available. Design data is obtainable from the SCS Harrisburg office.
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	(See Appendix F, Figures 4 and 5) Additional information available from the SCS Harrisburg office.

ITEM	REMARKS NDI# PA - 035
BORROW SOURCES	Drawing 2 of 9 "Storage Area". (Not included in Appendix F.)
POST CONSTRUCTION DAM SURVEYS	None since as-built.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	The project is inspected annually and after major floods. The inspection is carried out by the owner and is usually in the company of an SCS representative. A one-page report is prepared by the owner after each inspection. Copies are obtainable from the owner, PennDER, and SCS.
HIGH POOL RECORDS	Highest water to date reached elevation 1811.5 in September 1975.
MONITORING SYSTEMS	None.
MODIFICATIONS	None.

ITEM	REMARKS	NDI# PA - 035
PRIOR ACCIDENTS OR FAILURES	None.	
MAINTENANCE: RECORDS MANUAL	Maintenance reports filed annually (available from owner).	
OPERATION: RECORDS MANUAL	No operating mechanisms.	
OPERATIONAL PROCEDURES	The facility is designed to be self-regulating and requires minimal maintenance. There are no established formal operation and/or maintenance procedures; however, provisions for such procedures are contained within the "Operation and Maintenance Agreement" between the owner and U.S.D.A., Soil Conservation Service.	
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	No formal warning systems are in effect. According to representatives of the owner and local SCS, a high degree of communication and cooperation exists between the two parties. This coupled with an active an dependable Civil Defense Corps reportedly provides adequate warning and protection for downstream residents.	
MISCELLANEOUS	Copies of the "Operation and Maintenance Agreement" refered to above, are available from both the owner (Tioga County Commissioners) and the SCS at Wellsboro, PA.	

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

NDI ID # PA-035
PENN DER ID # 59-62

SIZE OF DRAINAGE AREA: 0.48 square miles

ELEVATION TOP NORMAL POOL: 1803.5 STORAGE CAPACITY: 10 acre-feet

ELEVATION TOP FLOOD CONTROL POOL: 1818.5 STORAGE CAPACITY: 80 acre-feet

ELEVATION MAXIMUM DESIGN POOL: 1821.9 STORAGE CAPACITY: 105 acre feet

ELEVATION TOP DAM: 1824 STORAGE CAPACITY: 120 acre-feet

SPILLWAY DATA

CREST ELEVATION: (service) 1803.5; (emergency) 1818.5

TYPE: (service) 2-stage drop inlet; (emergency) vegetated earth channel

CREST LENGTH: (service) 1st stage = 2 feet; 2nd stage = 15 feet; total = 17 feet

CREST LENGTH: (emergency) 50 feet

SPILLOVER LOCATION: (service) upstream toe; (emergency) left abutment

NUMBER AND TYPE OF GATES: none

OUTLET WORKS

TYPE: 30-inch diameter reinforced concrete conduit

LOCATION: base of service spillway riser

ENTRANCE INVERTS: 1791.0

EXIT INVERTS: 1786.6

EMERGENCY DRAWDOWN FACILITIES: 15-inch diameter B.C.C.M.P. pond drain

HYDROMETEOROLOGICAL GAGES

TYPE: None

LOCATION: -

RECORDS: -

MAXIMUM NON-DAMAGING DISCHARGE: High water el. 1811.5 in September 1975

APPENDIX B

CHECK LIST - VISUAL INSPECTION

CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM PA-455 Dam (Griffin Dam) STATE Pennsylvania COUNTY Tioga

NDI# PA - 035 PENNDER# 59-62

TYPE OF DAM Earth SIZE Small HAZARD CATAGORY High

DATE(S) INSPECTION 6 & 7 November 1978 WEATHER overcast & cold TEMPERATURE 40° @ 10:00 AM

POOL ELEVATION AT TIME OF INSPECTION 1803.5 M.S.L.

TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL	OWNER REPRESENTATIVES	OTHERS
B. M. Mihalcin		Don Lindsey (SCS Dist. Conserv.)
W. J. Veon		Dennis Carmin (SCS Area Engineer)
K. H. Khilji		Howard Kass (Balt. Dist Corps of Engrs.)
S. R. Michalski		
D. L. Bonk		

RECORDED BY D. L. Bonk

NDI# PA - 035

ITEM	OBSERVATIONS AND/OR REMARKS
SURFACE CRACKS	None observed.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Good condition.
RIPRAP FAILURES	No riprap protection has been included in the design of this facility.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition.

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 035
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	None observed.
ANY NOTICEABLE SEEPAGE	None observed.
STAFF GAGE AND RECORDER	None observed.
DRAINS	Two 6-inch diameter B.C.C.M.P. toe drains were observed at the downstream toe on either side of the outlet conduit. Neither drain was found discharging during the inspection.

OUTLET WORKS

NDI# PA - 035

ITEM	OBSERVATIONS AND/OR REMARKS
INTAKE STRUCTURE	A reinforced concrete, "drop inlet" type riser is located near the center of the upstream face of the embankment at approximately 15 feet below the crest. No signs of concrete deterioration were observed.
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	The discharge end of the 30-inch diameter reinforced concrete outlet conduit was observed projecting through the downstream face at the base of the toe in a cantilever position. The visible portion of the conduit is in good condition, however, signs of minor concrete deterioration were noted.
OUTLET STRUCTURE	None observed.
OUTLET CHANNEL	Small channel on a steep grade located in a lightly wooded area.
GATE(S) AND OPERATIONAL EQUIPMENT	There are no operating mechanisms associated with this facility.

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 035
TYPE AND CONDITION	Grass-lined trapezoidal earth channel in good condition located at the left abutment.
APPROACH CHANNEL	Good condition.
SPILLWAY CHANNEL AND SIDEWALLS	Grass-covered slopes in good condition.
STILLING BASIN PLUNGE POOL	None observed.
DISCHARGE CHANNEL	The emergency spillway is designed to divert discharge away from the embankment, over the left downstream hillside and into the stream channel at the base of the valley.
BRIDGE AND PIERS	None observed.
EMERGENCY GATES	None observed.

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 035
TYPE AND CONDITION	Reinforced concrete, "drop inlet" type riser with a 30-inch diameter reinforced concrete, low level, concrete discharge conduit.
APPROACH CHANNEL	Not applicable.
OUTLET STRUCTURE	Not applicable.
DISCHARGE CHANNEL	See "outlet channel" pg. 4 of 8.
POND DRAIN	Submerged and not observed.

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA -035
MONUMENTATION SURVEYS	None observed.
OBSERVATION WELLS	None observed.
WEIRS	None observed.
PIEZOMETERS	None observed.
OTHERS	None observed.

ITEM	OBSERVATIONS AND/OR REMARKS NDI# PA - 035
SLOPES: RESERVOIR	The area surrounding the reservoir is primarily grassland with the majority of the tree covered areas located near the top of the local hills. The slopes are gentle to moderate throughout the watershed.
SEDIMENTATION	None observed.
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Small, unlined channel on a moderate to steep slope. The stream is diverted through culverts beneath the local roadway several times before it finally discharges into Mill Creek on the downstream side of Sabinsville.
SLOPES: CHANNEL VALLEY	The area immediately downstream of the embankment is a broad valley with characteristics similar to those found within the watershed surrounding the pond and described in the first section of this page (slopes:reservoir).
APPROXIMATE NUMBER OF HOMES AND POPULATION	The valley downstream of the embankment is occupied by several farms the closest of which is within a few hundred feet of the dam. The village of Sabinsville, Pennsylvania, is located approximately 1.5 miles downstream. Its population according to Tioga County records is roughly 150 persons and it appears that at least 30 to 40 of these persons could be affected by an embankment breach.

APPENDIX C

HYDRAULICS/HYDROLOGY

SUBJECT DAM SAFETY INSPECTION
PA-455 (GRIFFIN DAM)

BY EJM DATE 11-20-78 PROJ. NO. 78-617-455

CHKD. BY DLB DATE 12-19-78 SHEET NO. 1 OF 11

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DAM STATISTICS

MAX. HEIGHT - 37 FEET (FIELD MEASURED)

DRAINAGE AREA - 0.48 SQ. MI (SEE NOTE AT BOTTOM OF PAGE)

STORAGE CAPACITY (@ TOP OF DAM EL 1824) - 120 AC-FT (SHEET 4 OF 11)

SIZE CLASSIFICATION

DAM SIZE: SMALL (REF 1; TABLE 1)

HAZARD RATING: HIGH (FIELD OBSERVATION)

REQUIRED SDF: 1/2 PMF TO PMF (REF 1, TABLE 3)

NOTE: PLANIMETERED FROM THE SABINSVILLE, PA., 7.5 MINUTE SERIES, U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP

D.A. = 3.32 IN^2 (D.A. = DRAINAGE AREA)

D.A. = 3.32 IN^2 (2000 FT/IN)^2 (1 MILE/5280 FT)^2

D.A. = 0.48 SQ. MI.

UBJECT DAM SAFETY INSPECTION
PA-455

:Y EJM DATE 11-9-78 PROJ. NO. 78-617-035

:HKD. BY DLB DATE 12-19-78 SHEET NO. 2 OF 11

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HYDROGRAPH PARAMETERS

LENGTH OF LONGEST WATERCOURSE (L) ≃ 1.09 mi

$L_{CA} \simeq 0.47$

[VALUES OF L AND L_{CA} ARE FROM U.S.G.S. 7.5 MINUTE SERIES QUADS]

NOTE: ALL VARIABLES ARE DEFINED IN REFERENCE 2 IN THE SECTION ENTITLED "SNYDER SYNTHETIC UNIT HYDROGRAPH".

$C_t = 0.8$

$C_p = 0.49$

[SUPPLIED BY COFE; ZONE 16, SUSQUEHANNA RIVER BASIN.]

t_p = SNYDER'S STANDARD LAG $= 0.8(L \times L_{CA})^{0.3}$

$t_p = (0.8)[(1.09)(0.47)]^{0.3}$

$t_p = 0.65$

SUBJECT DAM SAFETY INSPECTION
PA-455

BY WJV DATE 12/5/78 PROJ. NO. 78-617-035

CHKD. BY DLB DATE 12-19-78 SHEET NO. 3 OF 11

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PMP CALCULATIONS

- RAINFALL INDEX = 22.5 INCHES (FIG. 2, REF 9)
  (CORRESPONDING TO A DURATION OF 24-HOURS AND AN AREA OF 200 SQ. MI.)

- GEOGRAPHIC FACTOR = 100% (FIG 1, REF 9)
  (CORRESPONDING TO A LONGITUDE OF 77°32' AND A LATITUDE OF 41°51')

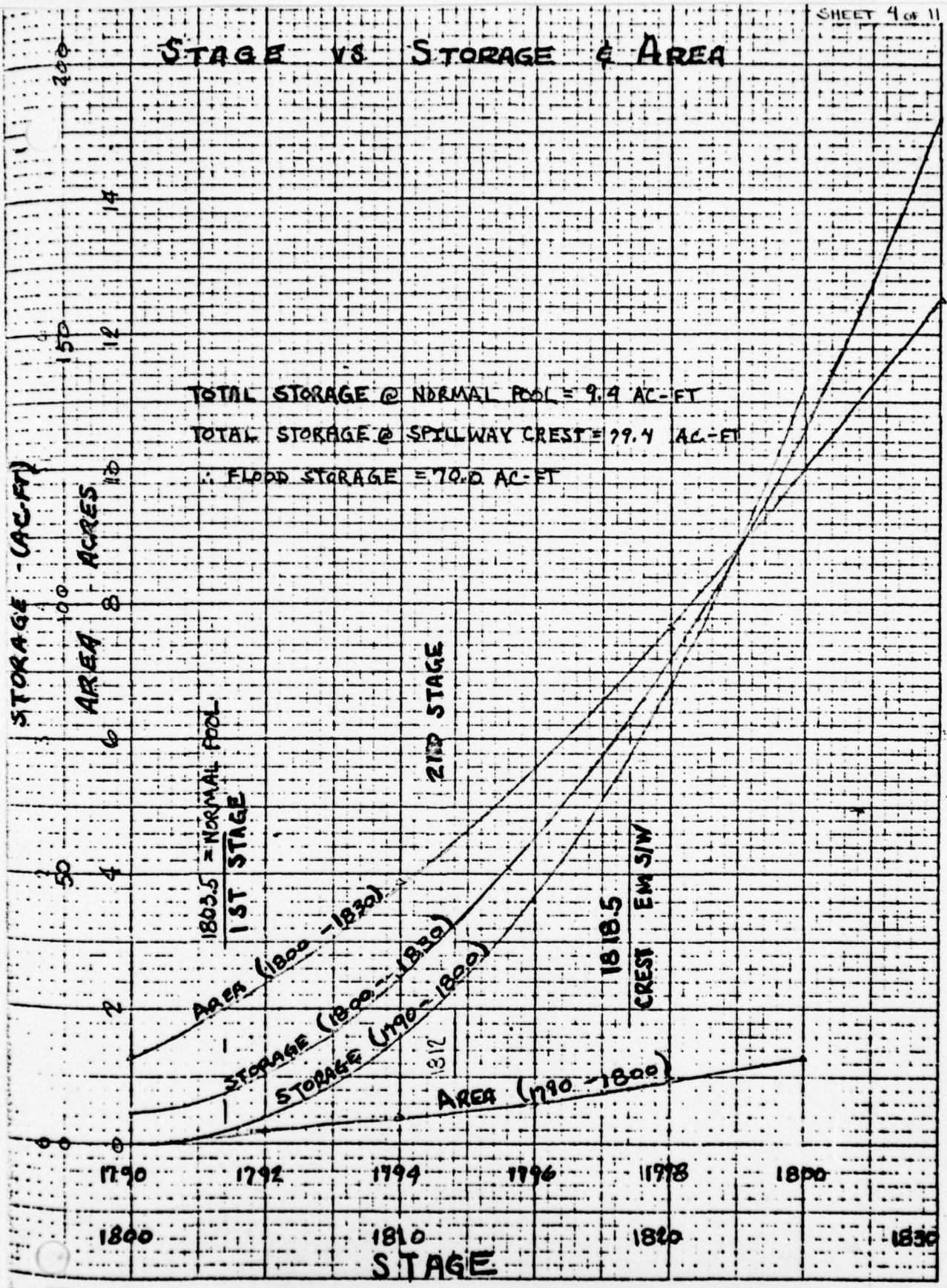
- DA = 0.48 SQ MI < 10 SQ MI ⇒ ASSUME 10 SQ MI DATA CAN EFFECTIVELY REPRESENT THE 0.48 SQ MI AREA

DURATION (HOURS)	PERCENT OF INDEX RAINFALL (%)
6	117.5
12	129.0
24	136.0
48	142.0

NOTE: THE CORPS OF ENGINEERS RECOMMENDS THE ANALYSIS BE BASED ON A 72-HR DURATION STORM. SUCCESSIVE TRIALS HAVE REVEALED A 48-HR STORM WITH 15-MINUTE TIME INTERVALS TO PROVIDE GREATER ACCURACY. HEC-1 REQUIRES 30-MINUTE INTERVALS FOR A 72-HR STORM. THIS HAS BEEN FOUND TO PRODUCE MISLEADING RESULTS FOR VERY SMALL DRAINAGE AREAS.

- HOP BROOK FACTOR (ADJUSTMENT FOR BASIN SHAPE, AS WELL AS FOR THE LESSER LIKELIHOOD OF A SEVERE STORM HITTING A SMALLER BASIN)
  CORRESPONDING TO DA = 0.49 SQ MI (< 10 SQ. MI) = 0.80
  (REF 4, PG 48)

STAGE VS STORAGE & AREA



THIS GRAPH WAS OBTAINED FROM SCS FILES LOCATED AT HARRISBURG, PA. WHERE IT WAS ATTACHED TO UNBOUND DESIGN CALCULATIONS FOR PROJECT PA-455

SUBJECT DAM SAFETY INSPECTION
PA-455

BY WJV DATE 11/22/78 PROJ. NO. 78-617-035

CHKD. BY DLB DATE 12-19-78 SHEET NO. 5 OF 11

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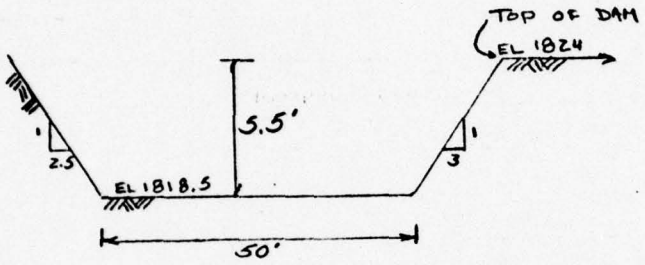
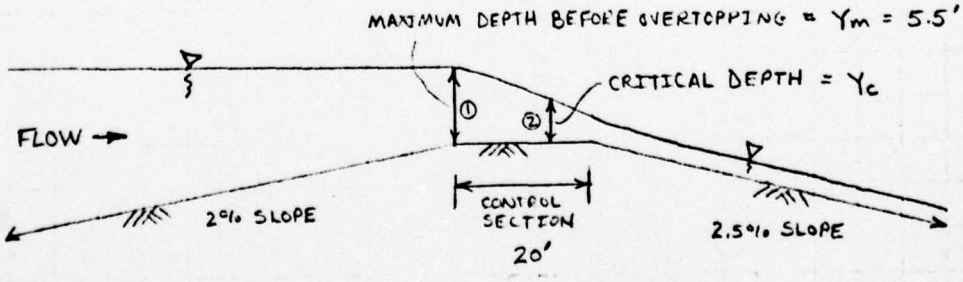
EMERGENCY SPILLWAY CAPACITY

TYPICAL SECTION ALONG CONTROL (NOT TO SCALE)



NOTE: ELEVATIONS ARE TAKEN FROM DRAWING 1 OF 1 BY THE U.S.D.A, S.C.S. ENTITLED "MILL CREEK WATERSHED PROJECT, PA-455", DATED 5-63. SEE FIGURE 3, APPENDIX F

SPILLWAY PROFILE (NOT TO SCALE)



ENERGY BALANCE BETWEEN ① AND ②: (REF. 13)

$$Y_m + \cancel{\frac{v_R^2}{2g}}^{\,0} = Y_c + \frac{v_c^2}{2g} + \cancel{H_L}^{\,0}$$

WHERE: H_L = HEAD LOSS BETWEEN ① AND ② ≈ 0

v_R = APPROACH VELOCITY (ASSUMED TO BE NEGLIGIBLE)

v_c = CRITICAL VELOCITY

SUBJECT DAM SAFETY INSPECTION
PA-455

BY WJV DATE 11/22/78 PROJ. NO. 78-617-035

CHKD. BY DLB DATE 12-19-78 SHEET NO. 6 OF 11

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$\therefore \quad Y_m = 5.5' = Y_c + {}^{v_c^2}/_{2g}$

AND $\quad v_c = {}^{Q}/_{A_c}$ (CONTINUITY EQ., REF 13)

FROM THE GEOMERTRY OF THE TYPICAL SECTION ON THE PREVIOUS PAGE :

$$A_c = 50\,Y_c + \tfrac{1}{2}(2.5 \times Y_c)(Y_c) + \tfrac{1}{2}(3.0 \times Y_c)(Y_c)$$
$$= 50\,Y_c + 2.75\,Y_c^2$$

$$\therefore \quad 5.5' = Y_c + \left[{}^{Q}/_{(50Y_c + 2.75Y_c^2)}\right]^2 / 2g \qquad (1)$$

ALSO AT CRITICAL DEPTH : $\quad Q^2 B_c = g A_c^3$ (REF 13, EQ 4-24; PG 141)

WHERE B_c = TOP WIDTH OF SECTION AT CRITICAL DEPTH

$B_c = 50 + 3.0\,Y_c + 2.5\,Y_c = 50 + 5.5\,Y_c$ (FROM SECT. GEOMETRY)

$$\therefore \quad Q = \sqrt{(g)(50Y_c + 2.75Y_c^2)^3 / (50 + 5.5Y_c)} \qquad (2)$$

SOLVE EQUATIONS (1) AND (2) BY TRIAL AND ERROR :

$$\therefore \quad Y_c = 3.86' \Rightarrow Q = \sqrt{\frac{(32.2)\left[50(3.86) + 2.75(3.86)^2\right]^3}{\left[50 + (5.5)(3.86)\right]}} = 2406 \text{ CFS}$$

SUBJECT DAM SAFETY INSPECTION
PA-455

BY WJV DATE 11/22/78 PROJ. NO. 78-617-035

CHKD. BY DLB DATE 12-19-78 SHEET NO. 7 OF 11

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THEN: $5.5' = 3.86' + \left[\frac{2406\ cfs}{(50')(3.96')+(2.75)(3.86')^2}\right]^2 / 2(32.2) = 5.5'$

∴ MAX y_c BEFORE OVERTOPPING = 3.86'
CORRESPONDING TO A MAX FLOW OF 2406 CFS
WITH A VELOCITY OF 10.3 FPS

CHECK FOR SUPERCRITICAL DS SLOPE:

$$S_c = \left(\frac{n\, v_c}{1.49\, R_c^{2/3}}\right)^2$$ (REF 13, EQ 4-31, pg 143)

R_c = HYDRAULIC RADIUS = (AREA OF FLOW / WETTED PERIMETER)

$R_c = 234\ ft^2 / (50\ ft + 12.2\ ft + 10.4\ ft) = 3.22\ ft$

$n = 0.032$ BASED ON PRODUCT OF $v_c R_c = 33.2$, RETARDANCE = C AND EXHIBIT 7-1 OF THE SCS "ENGINEERING FIELD MANUAL FOR CONSERVATION PRACTICES"

∴ $S_c = \left[\frac{(0.032)(10.3\ fps)}{(1.49)(3.22)^{2/3}}\right]^2 = 0.0103$ < ACTUAL SLOPE OF 0.025 ⇒ CRITICAL FLOW ASSUMPTION - OK

⇒ MAXIMUM SPILLWAY CAPACITY = 2406 CFS

SUBJECT DAM SAFETY INSPECTION
PA-455

BY WJV DATE 12/13/78 PROJ. NO. 78-617-035

CHKD. BY DLB DATE 12-19-78 SHEET NO. 8 OF 11

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SPILLWAY RATING CURVE

CRITICAL DEPTH RATING CURVE FOR PREVIOUSLY SKETCHED TRAPEZOIDAL SPILLWAY CONTROL SECTION BASED ON EQUATIONS 1 AND 2 (SHEET 6 OF 11)

$$Y_m = H = Y_c + \left[Q/(50\,Y_c + 2.75\,Y_c^2) \right]^2 / 2g \qquad (1)$$

$$Q = \sqrt{(g)(50Y_c + 2.75\,Y_c^2)^3 / (50 + 5.5\,Y_c)} \qquad (2)$$

WHERE $Y_m = H$ = HEIGHT OF RESERVOIR ABOVE SPILLWAY IN FEET
(AND ALL OTHER TERMS ARE AS BEFORE)

SPILLWAY ELEVATION = 1919.5 FT (SHEET 5 OF 11)

ELEVATION (FEET)	H (FEET)	Q (CFS)
1919.5	0	0
1920.0	0.5	55
1920.5	1.0	159
1921.0	1.5	301
1921.5	2.0	470
1922.0	2.5	666
1922.5	3.0	892
1923.0	3.5	1146
1923.5	4.0	1425
1924.0	4.5	1720
	5.0	2056
	5.5	2406

DAM SAFETY INSPECTION PENNSYLVANIA 455
PA-455 DAM-- TIOGA COUNTY COMMISSION
15-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
192	0	15	0	0	0	0	0	0	0
			JOPER	NRT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 6 LRTIO= 1
RTIOS= .20 .30 .40 .50 .75 1.00

OVERTOPPING ANALYSIS: HEC-1- DAM INPUT/OUTPUT

SUBJECT DAM SAFETY INSPECTION PA-455
BY WJV DATE 1/11/79 PROJ. NO. 78-617-035
CHKD. BY DLB DATE 1/11/79 SHEET NO. 9 OF 11

SUB-AREA RUNOFF COMPUTATION

INFLOW TO RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.48	0.00	.48	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.50	117.50	127.00	136.00	142.50	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

INITIAL AND CONSTANT RAINFALL LOSS RATES, OBTAINED FROM THE BALTIMORE DISTRICT COE

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= .65 CP= .49 NTA= 0

BASEFLOW GENERATION PARAMETERS, OBTAINED FROM THE BALTIMORE DISTRICT COE

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 2.56 AND R= 3.71 INTERVALS

UNIT HYDROGRAPH 21 END-OF-PERIOD ORDINATES, LAG= .65 HOURS, CP= .49 VOL= 1.00

50.	163.	221.	191.	146.	111.	85.	65.	49.	38.
29.	22.	17.	13.	10.	7.	6.	4.	3.	3.
2.									

END-OF-PERIOD FLOW

NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	25.65	23.35	2.30	28854.
										(652.)(593.)(58.)(817.05)			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1955.	992.	299.	150.	28840.
CMS	55.	28.	8.	4.	817.
INCHES		19.22	23.21	23.29	23.29
MM		488.24	589.52	591.52	591.52
AC-FT		492.	594.	596.	596.
THOUS CU M		607.	733.	735.	735.

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SUBJECT DAM SAFETY INSPECTION PA-455

BY WJV DATE 1/11/79 PROJ. NO. 78-617-035

CHKD. BY DLB DATE 1/11/79 SHEET NO. 10 OF 11

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HYDROGRAPH ROUTING

ROUTE THRU RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
101	1	0	0	0	0	1	0	0

ROUTING DATA

GLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	-1

STAGE	1818.50	1819.00	1819.50	1820.00	1820.50	1821.00	1821.50	1822.00	1822.50
	1823.50	1824.00							
FLOW	0.00	55.00	159.00	301.00	470.00	666.00	892.00	1146.00	1425.00
	2050.00	2406.00							
CAPACITY	0.	7.	21.	42.	70.	76.	81.	89.	96.	106.
	114.	124.	134.	146.					
ELEVATION=	1804.	1806.	1810.	1814.	1819.	1819.	1820.	1821.	1822.	1823.
	1824.	1825.	1826.	1827.					

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
1818.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1824.0	0.0	0.0	0.

STATION 101, PLAN 1, RATIO 6

PEAK OUTFLOW IS 1873. AT TIME 40.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1873.	972.	264.	132.	25296.
CMS	53.	28.	7.	4.	716.
INCHES		18.84	20.43	20.43	20.43
MM		478.65	518.83	518.83	518.83
AC-FT		482.	523.	523.	523.
THOUS CU M		595.	645.	645.	645.

SUBJECT DAM SAFETY INSPECTION
PA 455

BY WJV DATE 1/11/79 PROJ. NO. 79-617-035

CHKD. BY DLB DATE 1/11/79 SHEET NO. 11 OF 11

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Engineers • Geologists • Planners
Environmental Specialists

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1803.50	1818.50	1824.00
STORAGE	0.	70.	114.
OUTFLOW	0.	0.	2406.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1819.73	0.00	79.	225.	0.00	41.75	0.00
.30	1820.57	0.00	86.	497.	0.00	40.75	0.00
.40	1821.14	0.00	90.	731.	0.00	40.50	0.00
.50	1821.57	0.00	93.	927.	0.00	40.50	0.00
.75	1822.44	0.00	100.	1391.	0.00	40.50	0.00
1.00	1823.23	0.00	108.	1873.	0.00	40.50	0.00

LIST OF REFERENCES

1. "Recommended Guidelines for Safety Inspection of Dams," prepared by Department of the Army Office of the Chief of Engineers, Washington, D. C. (Appendix D).

2. "Unit Hydrograph Concepts and Calculations," by Corps of Engineers, Baltimore District (L-519).

3. "Seasonal Variation of Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Duration of 6, 12, 24, and 48 Hours," Hydrometeorological Report No. 33, prepared by J. T. Riedel, J. F. Appleby and R. W. Schloemer Hydrologic Service Division Hydrometeorological Section, U. S. Department of the Army, Corps of Engineers, Washington, D. C., April 1956.

4. Design of Small Dams, U. S. Department of the Interior, Bureau of Reclamation, Washington, D. C., 1973.

5. Handbook of Hydraulic, H. W. King and E. F. Brater, McGraw-Hill, Inc., New York, 1963.

6. Standard Handbook for Civil Engineers, F. S. Merritt McGraw-Hill, Inc., New York, 1968.

7. Open-Channel Hydraulics, V. T. Chow, McGraw-Hill, Inc., New York, 1959.

8. Weir Experiments, Coefficients, and Formulas, R. E. Horton, Water Supply and Irrigation Paper No. 200, Department of the Interior, United States Geological Survey, Washington, D. C., 1907.

9. "Probable Maximum Precipitation Susquehanna River Drainage Above Harrisburg, Pennsylvania," Hydrometeorological Report 40, prepared by H. V. Goodyear and J. T. Riedel Hydrometeorological Branch Office of Hydrology, U. S. Weather Bureau, U. S. Department of Commerce, Washington, D. C., May 1965.

10. Flood Hydrograph Package (HEC-1) Dam Safety Version, Hydrologic Engineering Center, U. S. Army Corps of Engineers Dams, California, July 1978.

11. "Simulation of Flow Through Broad Crest Navigation Dams with Radial Gates," R. W. Schmitt, U. S. Army Corps of Engineers, Pittsburgh District.

12. "Hydraulics of Bridge Waterways," BPR, 1970, Discharge Coefficient Based on Criteria for Embankment Shaped Weirs, Figure 24, page 46.

13. Applied Hydraulics in Engineering, Morris, Henry M. and Wiggert, James M., Virginia Polytechnic Institute and State University, 2nd Edition, The Ronald Press Company, New York, 1972.

14. Standard Mathematical Tables, 21st Edition, The Chemical Rubber Company, 1973, page 15.

15. Engineering Field Manual, U. S. Department of Agriculture, Soil Conservation Service, 2nd Edition, Washington, D. C. 1969.

APPENDIX D

PHOTOGRAPHS

PHOTOGRAPH 1 View of the embankment taken from approximately 500 feet downstream.

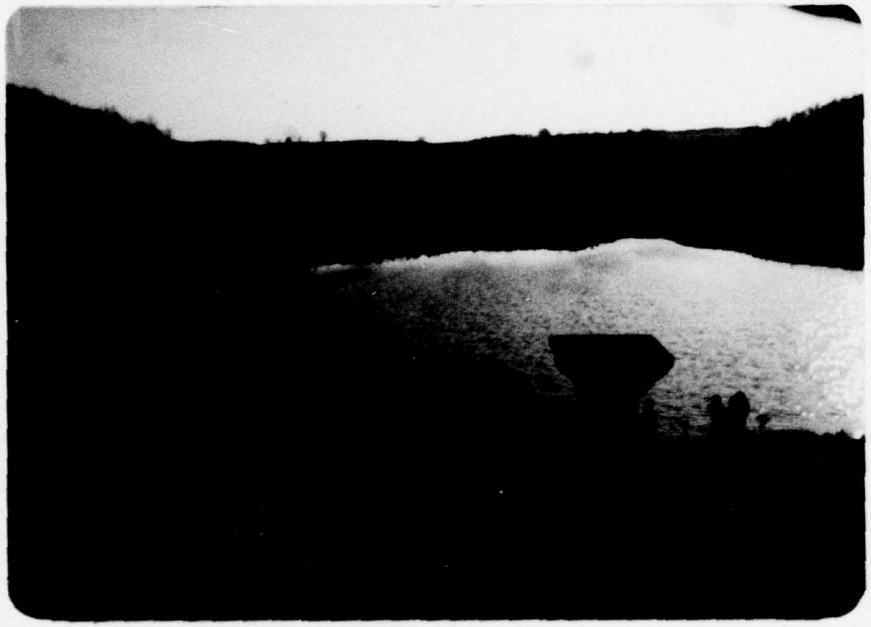
PHOTOGRAPH 2 View along the embankment crest from the right abutment. In addition to the reservoir and service spillway, the emergency spillway can be seen at the base of the tree line along the left abutment.

PHOTOGRAPH 3 View from atop the embankment crest looking northwest and into the surrounding watershed. The farmhouses visible in the background are situated well above maximum pool elevation.

PHOTOGRAPH 4 View of the service spillway riser.

1

2



3

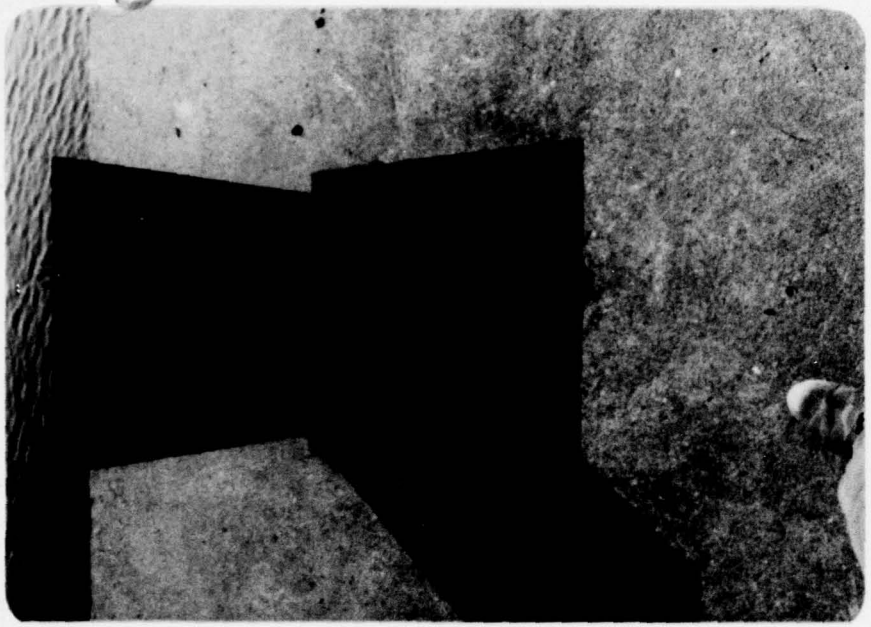
4

PHOTOGRAPH 5 View from atop the service spillway riser showing the access manhole.

PHOTOGRAPH 6 Interior view of the service spillway riser. The primary overflow inlet at elevation 1803.5 is visible to the right of center.

PHOTOGRAPH 7 View of the trash rack over the primary inlet located on the upstream face of the riser.

PHOTOGRAPH 8 View of the primary discharge conduit of the service spillway located at the downstream toe near the center of the embankment. Also visible are two 6-inch B.C.C.M.P. toe drains situated at either side of the concrete conduit.



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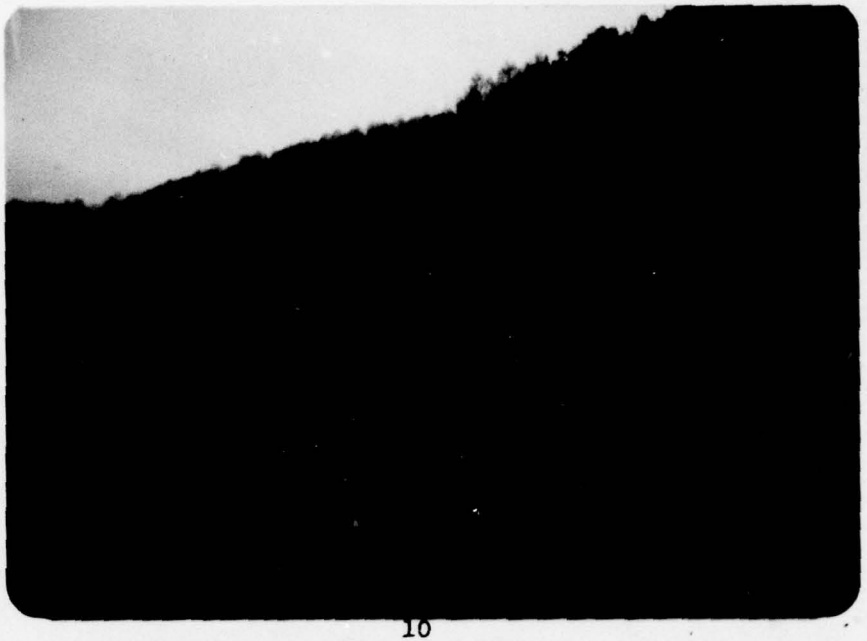
PHOTOGRAPH 9 View of the curved emergency spillway channel taken from the left abutment. Also visible is a large portion of the downstream valley looking toward the village of Sabinsville.

PHOTOGRAPH 10 View from within the emergency spillway channel looking upstream.

PHOTOGRAPH 11 View of the downstream face of the embankment from the discharge end of the emergency spillway channel. The right center of the photograph shows a cut portion of the earth dike to direct discharge away from the embankment toe.

PHOTOGRAPH 12 View from atop the embankment crest of the valley immediately downstream. The primary discharge conduit is visible in the lower left foreground.

9



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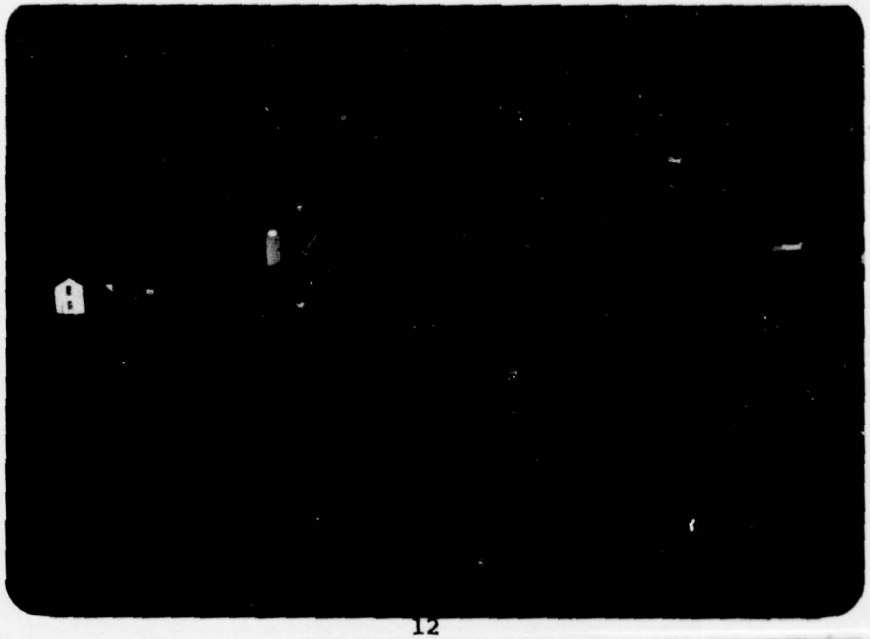


12

APPENDIX E

GEOLOGY

SITE GEOLOGY AND SOILS

General

PA-455 Dam is located approximately 1.5 miles southwest of Sabinsville within the northwest quarter of Tioga County. Geographically, the site is situated within the glaciated portion of the Allegheny High Plateaus Section of the Appalachian Plateaus Province. The area surrounding the site and watershed is blanketed with a veneer of glacial soil deposited during the most recent period of continental glaciation. Glacial fill and drift generally consist of cobble and boulder deposits, dense, fine grained, non-plastic soils, less dense poorly graded mixtures of silt, sand, gravel, and clay, at or near the surface and lenses of silty sands all of Wisconsin age. Overlying the glacial deposits are recent alluvial deposits in the valley floors and colluvial materials on the valley side slopes. Bedrock underlying the site and surrounding area consists of marine siltstones and fine grained sandstones of the lower portion of the Upper Devonian stratigraphic section. Structurally the site lies just south of the Sabinsville anticline, a gentle fold striking with little surface expression in the vicinity of the site. Bedrock, therefore, can be expected to dip gently to the southeast.

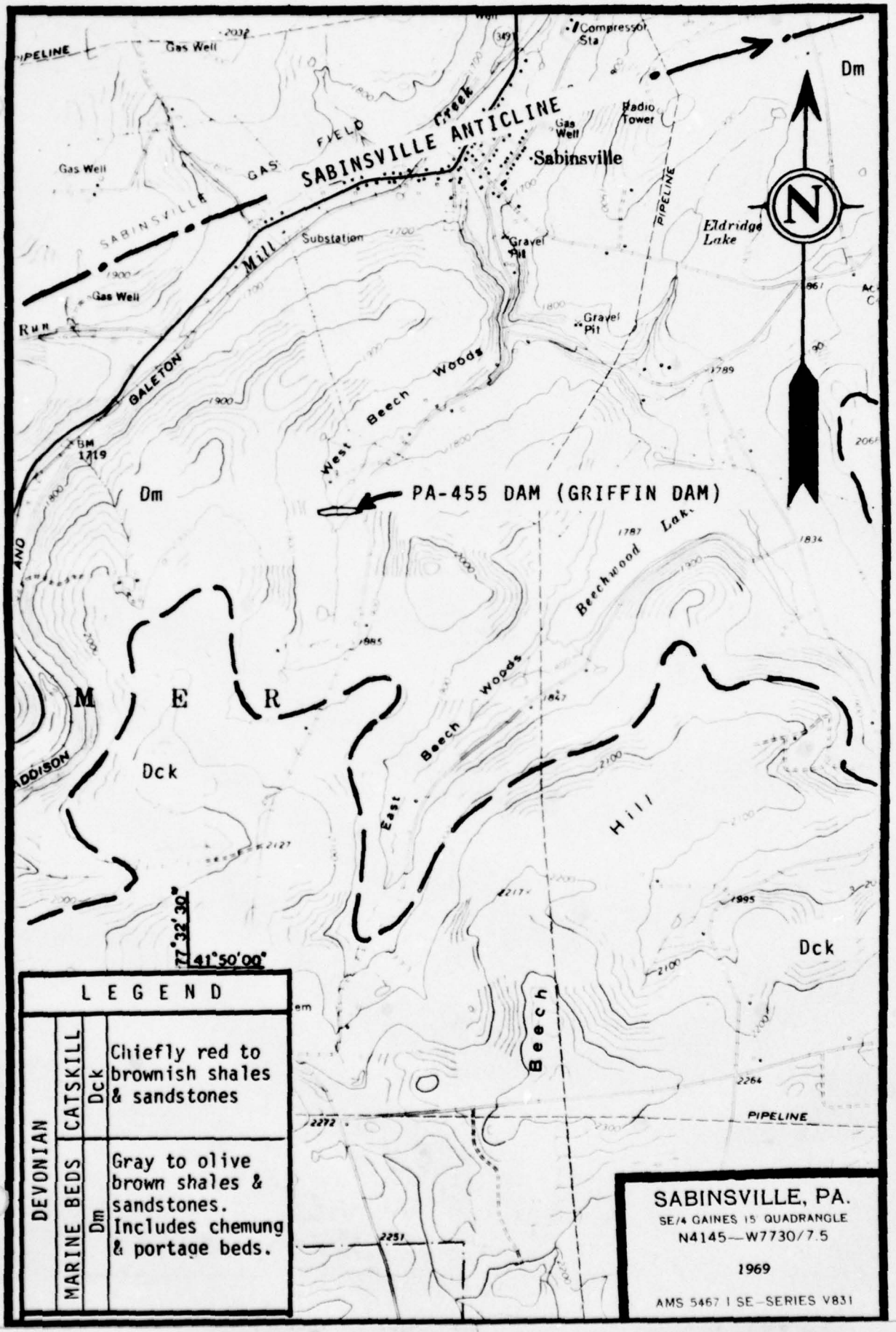
Detail

A detailed subsurface exploration program utilizing

test pits and borings was conducted on the foundation area of the embankment, principal spillway, and emergency spillway. Additional test pits and borings were also made in the borrow area and within the impoundment area upstream of the embankment. The results of this program indicate a moderately thick blanket of glacial drift underlying the embankment and appurtenant structures. This material is largely composed of silty sands and gravels with zones of cobbles and boulders up to 3 feet in diameter. Stratification of the glacial deposit suggests that deposition occurred in an outwash plain. Along the crest centerline of the embankment the top of rock was encountered at 16.2 feet in Drillhole #2 and at 22.6 feet in Drillhole #302. The latter boring was made at the lowest topographic elevation along the crest centerline.

Artesian water was encountered in the deep drill holes which penetrated bedrock. Drillhole #302 slightly overflowed the surface at the rate of .017 gal/min.

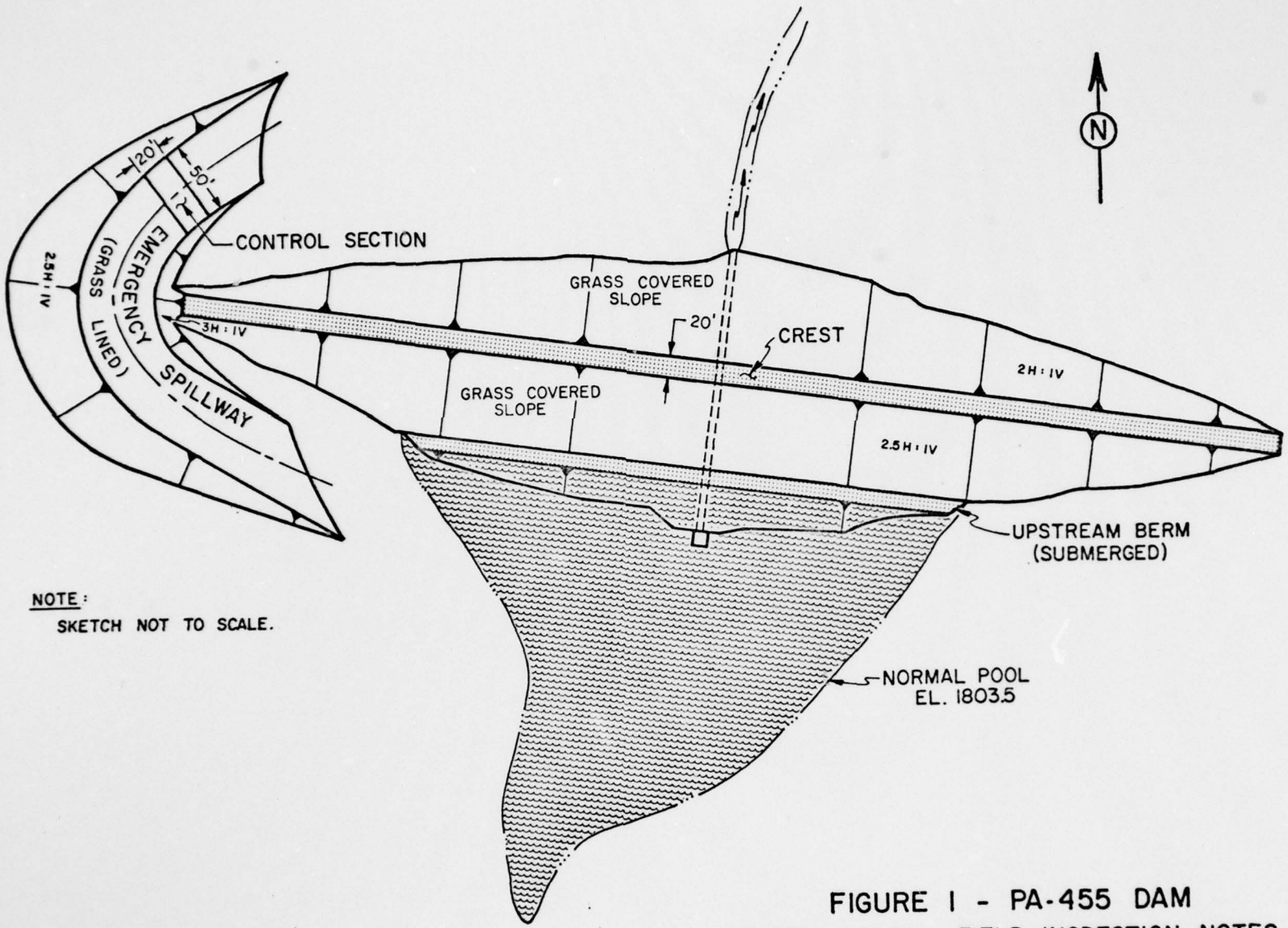
Borrow material for the embankment (glacial outwash consisting mainly of silty and clayey gravels) was secured from the valley wall within the impoundment area and from the emergency spillway excavation.


SABINSVILLE ANTICLINE
GAS FIELD
Sabinsville
Compressor Sta
Radio Tower
Gas Well
Gas Well
Gas Well
Gas Well
PIPELINE
PIPELINE
Mill Run
Substation
Gravel Pit
Gravel Pit
Eldridge Lake
Beechwood Lake
West Beech Woods
East Beech Woods
Beech Hill
BM 1719
GALETON
SABINSVILLE
Dm
Dck
Dck
Dm
PA-455 DAM (GRIFFIN DAM)
M E R
77°32'30"
41°50'00"
N
LEGEND
DEVONIAN
MARINE BEDS
CATSKILL
Dck
Chiefly red to brownish shales & sandstones
Dm
Gray to olive brown shales & sandstones. Includes chemung & portage beds.
SABINSVILLE, PA.
SE/4 GAINES 15 QUADRANGLE
N4145—W7730/7.5
1969
AMS 5467 I SE—SERIES V831

APPENDIX F

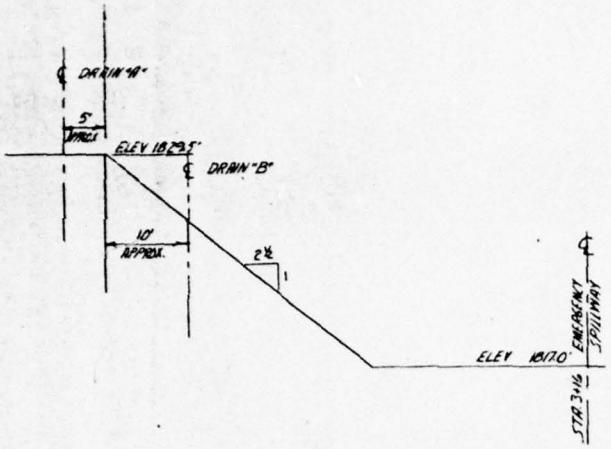
FIGURES

LIST OF FIGURES



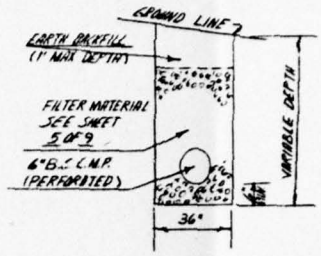
NOTE:
SKETCH NOT TO SCALE.

FIGURE 1 - PA-455 DAM
GENERAL PLAN • FIELD INSPECTION NOTES

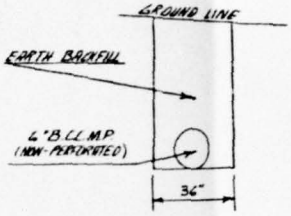


"X" SECTION OF
EMERGENCY SPILLWAY
AND
DRAIN LOCATION

SCALE HOR 1"= 40'
VER 1"= 4'



TYPICAL SECTION
(NOT TO SCALE)
STA 0+00 TO 2+80 (DRAIN "A"),
& ALL OF DRAIN "B"



TYPICAL SECTION
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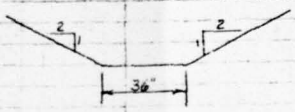
STA 2+80 TO 3+90 (DRAIN "A")



TYPICAL SECTION
(NOT TO SCALE)
FROM STA 3+90 TO OUTLET

PROFILE OF DRAIN "A"

SCALE HOR 1"=100'
VER 1"=4'

59-62-11
FILE NUMBER

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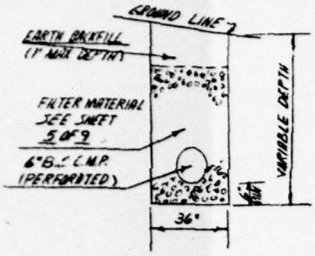
Clarence H. Davidson
File Clerk

REC'D _____ FOR _____
SEE REPORT NO. _____
_____
Div. Dams



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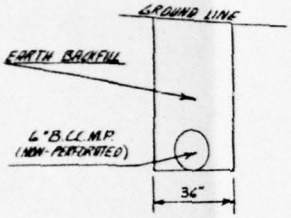
STA 0+00 TO 2+80 (DRAIN "A"), & ALL OF DRAIN "B"



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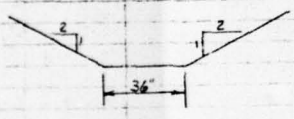
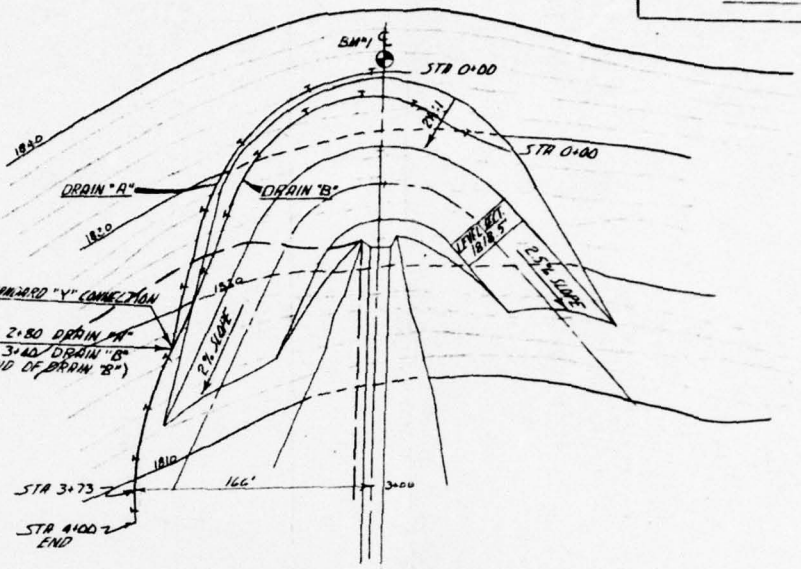
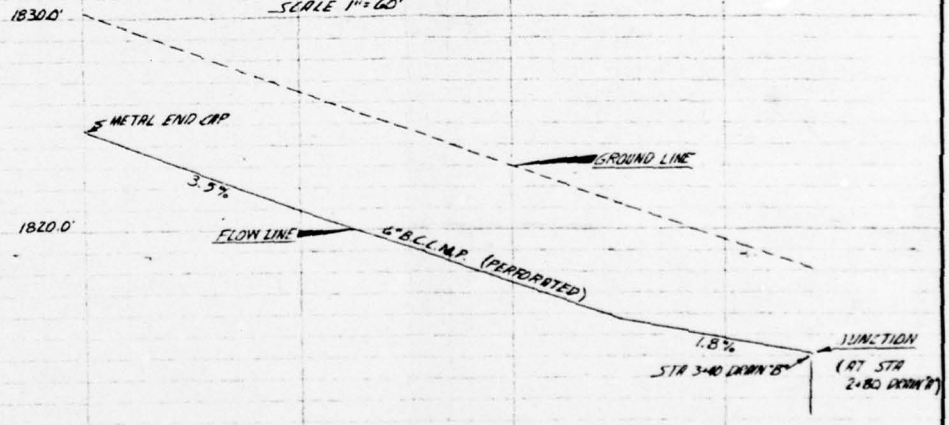
STA 2+80 TO 3+90 (DRAIN "A")

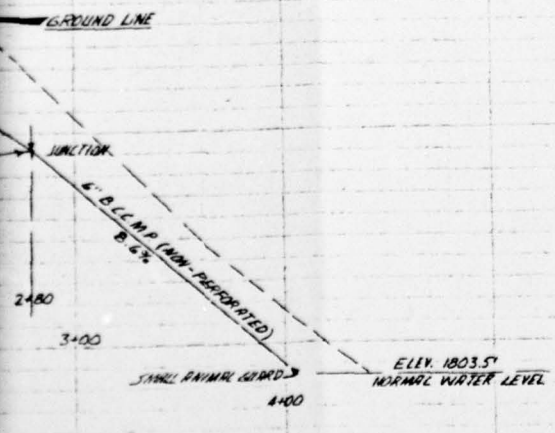


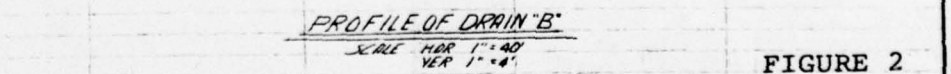
TYPICAL SECTION
(NOT TO SCALE)
FROM STA 3+90 TO OUTLET



PLAN VIEW
SCALE 1" = 60'







PROFILE OF DRAIN "B"
SCALE HOR 1" = 40'
VER 1" = 4'

FIGURE 2

NOTE:
FINAL LINE AND GRADE TO BE DETERMINED IN THE FIELD BY THE ENGINEER.

MILL CREEK WATERSHED PROJECT
TIOGA COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-455
EMERGENCY SPILLWAY DRAIN A & B

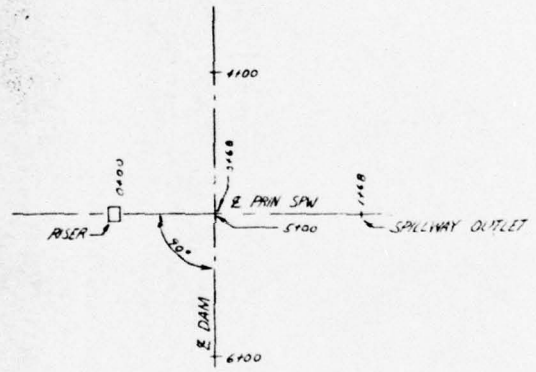
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	H. L. WALLACE	Date	5-63
Drawn	R. MAYS		5-63
Traced			
Checked			

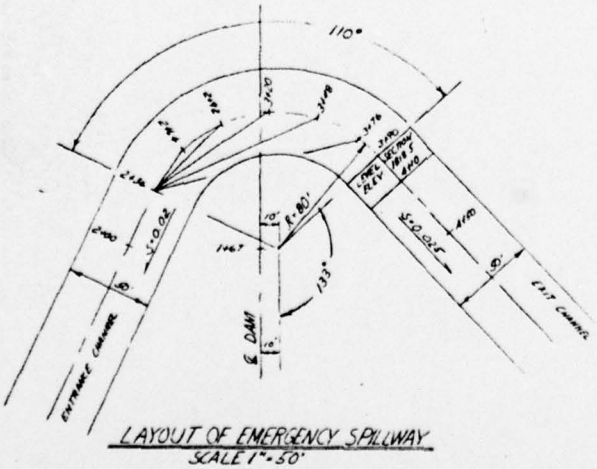
Approved By: Carl E. Barbour
Title: State Conservation Engineer
Title
Sheet No. 1 of 1
Drawing No. PA-455

GENERAL NOTES

1. ALL FILL TO BE COMPACTED CLASS "B-2" SPEC S-58
2. SCATTERED TREES UNDER THE DAM, EMERGENCY SPILLWAY, NORMAL POOL AREA AND BORROW AREA TO BE CLEARED AND GRUBBED. SPEC C-58
3. FENCE SALVAGE IS NOT A SEPARATE PAY ITEM BUT IS SUBSIDIARY TO OTHER ITEMS IN THE CONTRACT.



LAYOUT OF PRINCIPAL SPILLWAY
SCALE 1"=60'

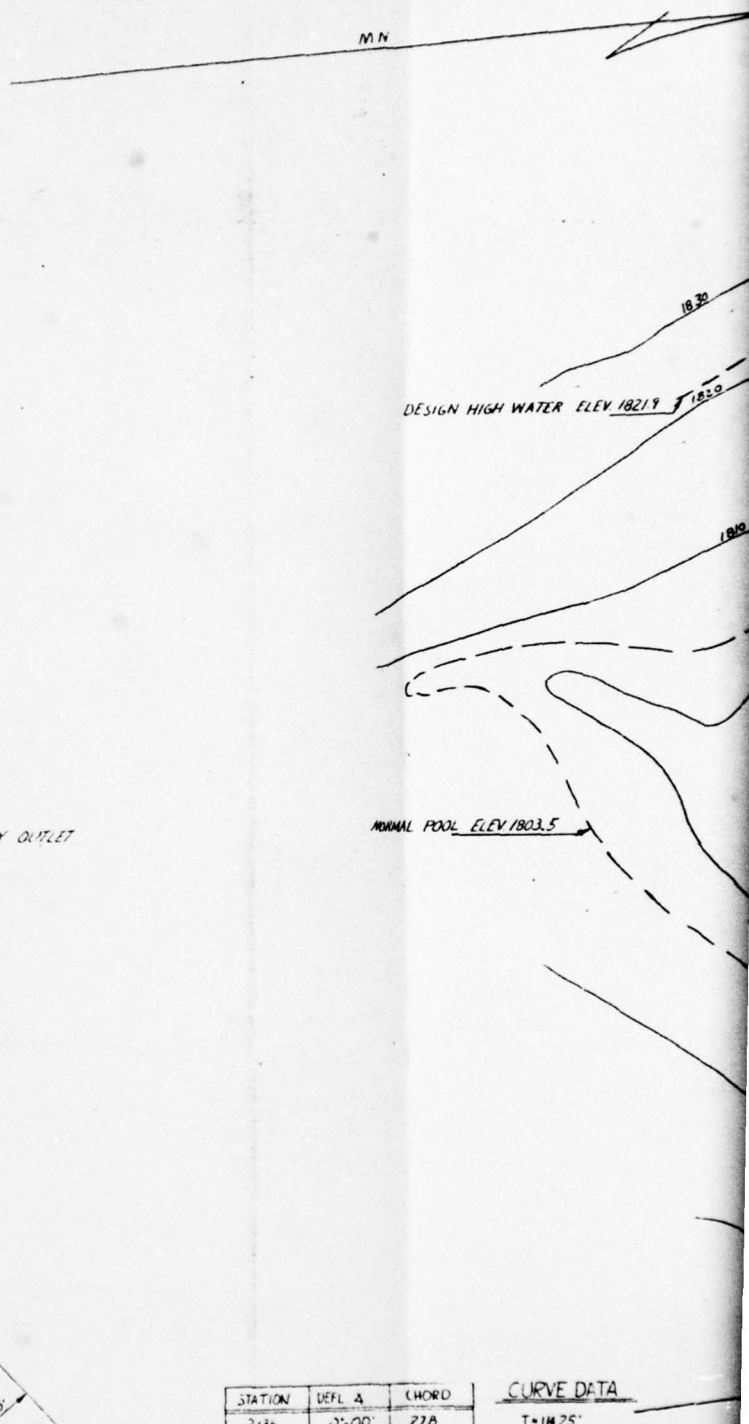


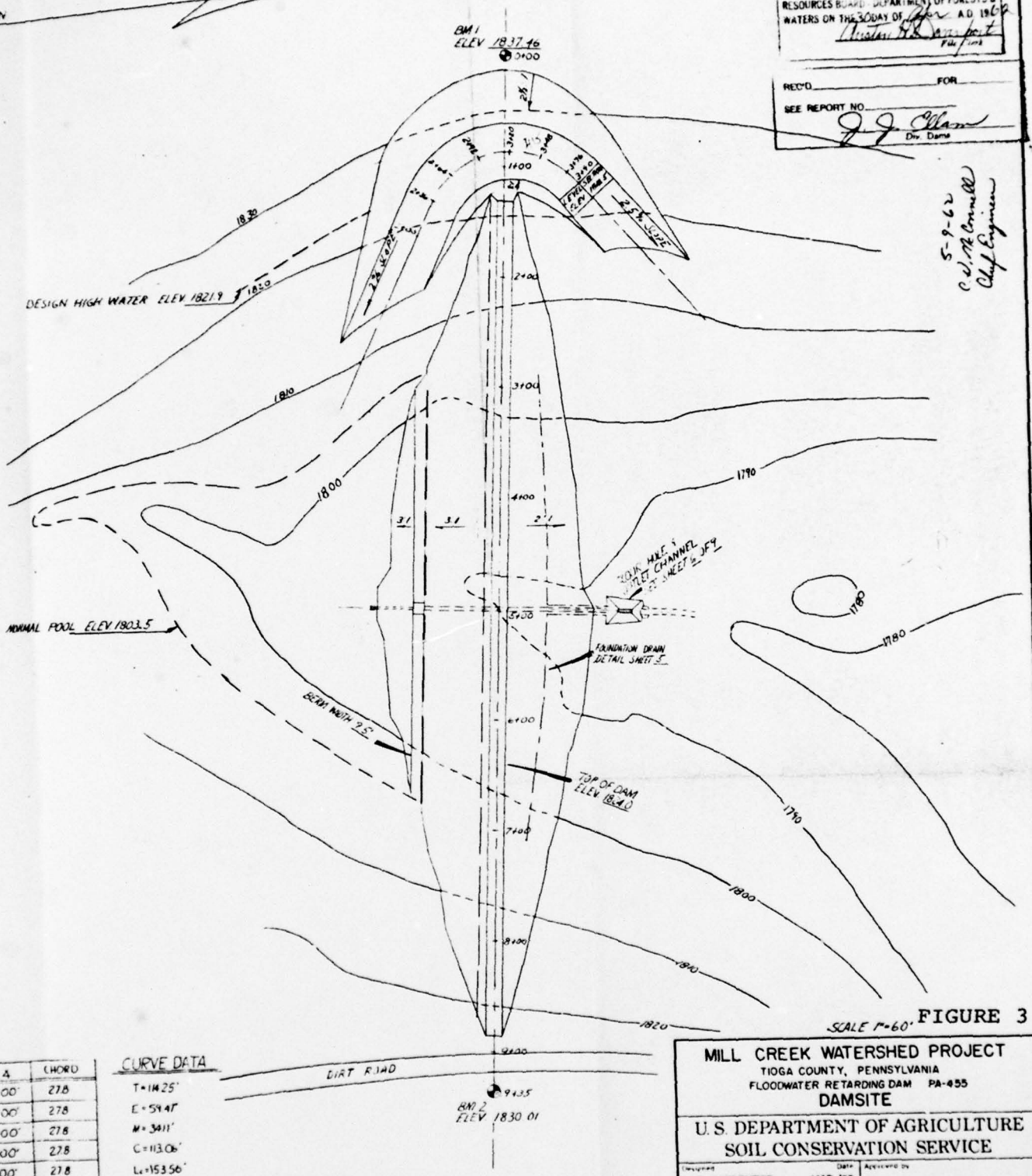
LAYOUT OF EMERGENCY SPILLWAY
SCALE 1"=50'

STATION	DEFL Δ	CHORD
2+36	3°-00'	27.8
2+64	10°-00'	27.8
2+92	10°-00'	27.8
3+20	10°-00'	27.8
3+48	10°00'	27.8
3+76	10°-00'	27.8
3+90	5°-00'	13.9

CURVE DATA

T = 114.25'
E = 59.47'
M = 34.11'
C = 113.06'
L = 153.56'





59-62-2

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Division Director

RECD. FOR

SEE REPORT NO.

Div. Dams

5-9-62
C.J. McConnell
Chief Engineer

STATION	DEFL. Δ	CHORD
2+36	3°-00'	27.8
2+64	10°-00'	27.8
2+92	10°-00'	27.8
3+20	10°-00'	27.8
3+48	10°00'	27.8
3+76	10°-00'	27.8
3+90	5°-00'	13.9

CURVE DATA

T = 114.25'
E = 59.47'
M = 34.11'
C = 113.06'
L = 153.56'

FIGURE 3

MILL CREEK WATERSHED PROJECT
TIOGA COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-455
DAMSITE

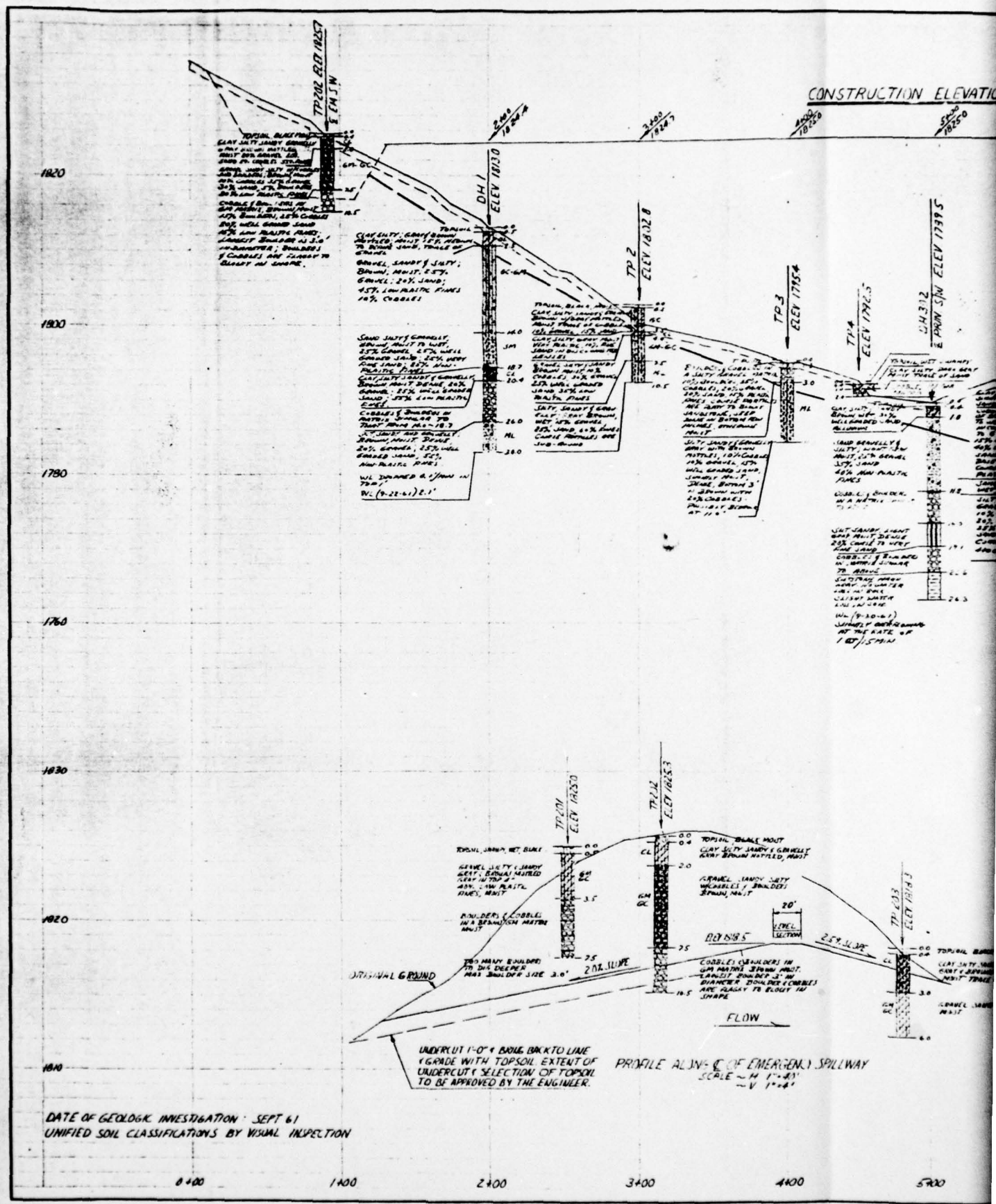
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed D CARPENTER	Date MAR '62	Approved by
Drawn G VAN BUSKIRK	MAR '62	
Traced		
Checked L WALL	MAR '62	

Sheet No. 3 of 9 sheets

Drawing No. PA-455-P

Form SCS 313 (November 1955)



DATE OF GEOLOGIC INVESTIGATION · SEPT 61
UNIFIED SOIL CLASSIFICATIONS BY VISUAL INSPECTION

59-62-3

FILE NUMBER

RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD - DEPARTMENT OF FORESTS & WATERS ON THE 20 DAY OF Nov A.D. 1962

Clerk

APPROX. STRIPPING LINE

REC'D FOR

SEE REPORT NO.

Dir. Dams

5-9-62

C. V. McConnell
Chief Engineer

CONSTRUCTION ELEVATIONS

APPROX BOTTOM OF CUT-OFF TRENCH
FINAL DEPTH TO BE DETERMINED
IN THE FIELD BY THE ENGINEER

TP 3 ELEV 17754

TP 4 ELEV 17825

CH 312 E PAVN S/W ELEV 17395

TP 5 ELEV 17913

OH 6 ELEV 17981

TP 7 ELEV 18036

TP 8 ELEV 18019

PROFILE ALONG ℄ DAM

SCALE: HOR ~ 1" = 40'
VERT ~ 1" = 8'

12'-0"

TYPICAL SECTION OF CUT-OFF TRENCH

SCALE: HOR ~ 1" = 40'
VERT ~ 1" = 4'

TP 12 ELEV 16853

TP 203 ELEV 16845

20'

LEVEL SECTION

2.5% SLOPE

FLOW

PROFILE ALONG ℄ OF EMERGENCY SPILLWAY

SCALE ~ H 1" = 40'
~ V 1" = 4'

28'

50'

TYPICAL SECTION OF EMERGENCY SPILLWAY

SCALE: HOR ~ 1" = 20'
VERT ~ 1" = 20'

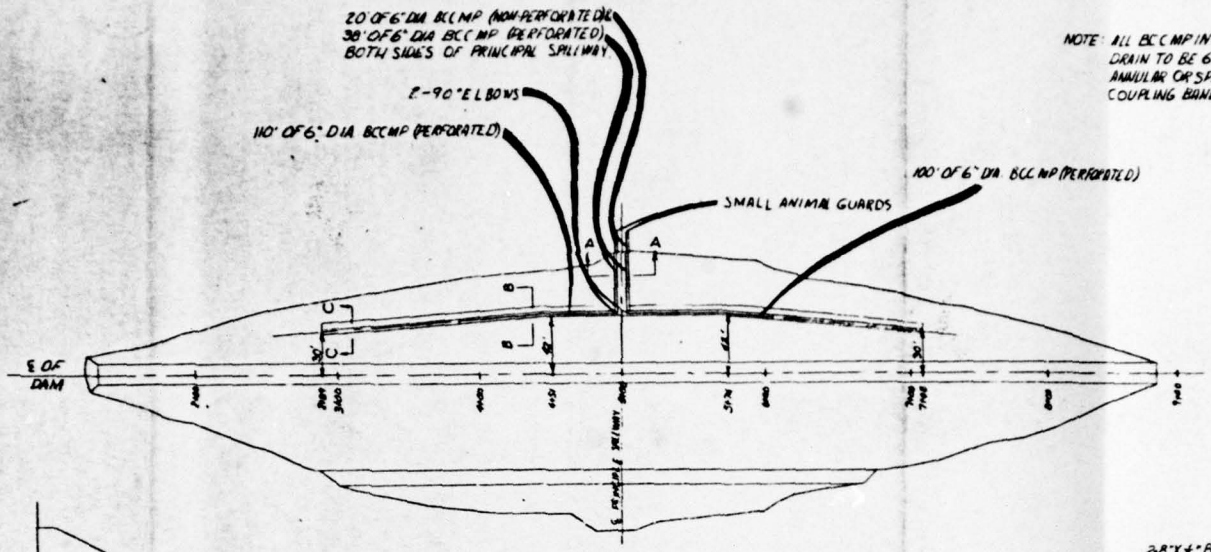
4400 5400 6400 7400

FIGURE 4

MILL CREEK WATERSHED PROJECT
TIOGA COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-455
PROFILES OF DAM & EMERGENCY SPILLWAY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

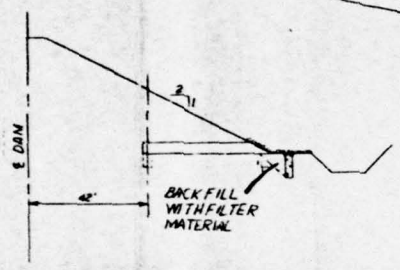
Designed	Date	Approved by
D CARPENTER	MAR '62	Title
Drawn		
G VAN BUSKIRK	MAR '62	Title
Traced		
Checked		
L WALL	MAR '62	Sheet No. 4 of 9 — Drawing No. PA-455-P

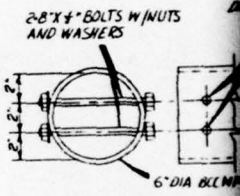
Form SCS 31c (November 1955)



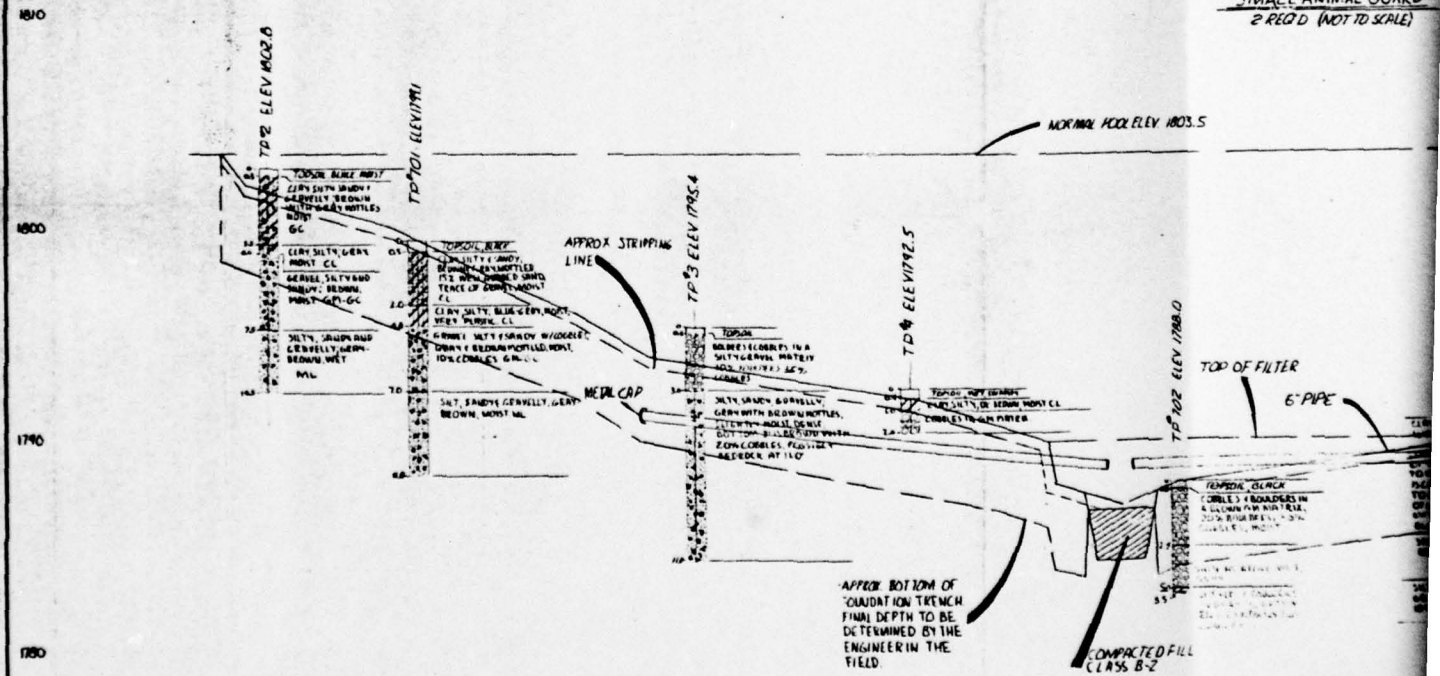
NOTE: ALL BCCMP IN FOUNDATION DRAIN TO BE 6" DIA 16 GAUGE ANNULAR OR SPIRAL, WITH STD COUPLING BANDS.

PLAN VIEW OF FOUNDATION DRAIN
SCALE: 1"=60'





SMALL ANIMAL GUARD
2 REQ'D (NOT TO SCALE)

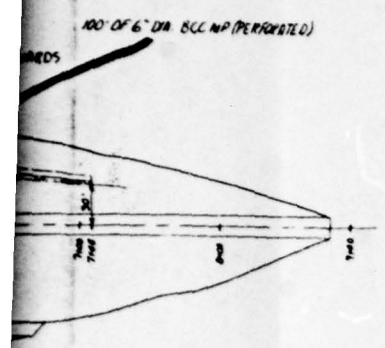


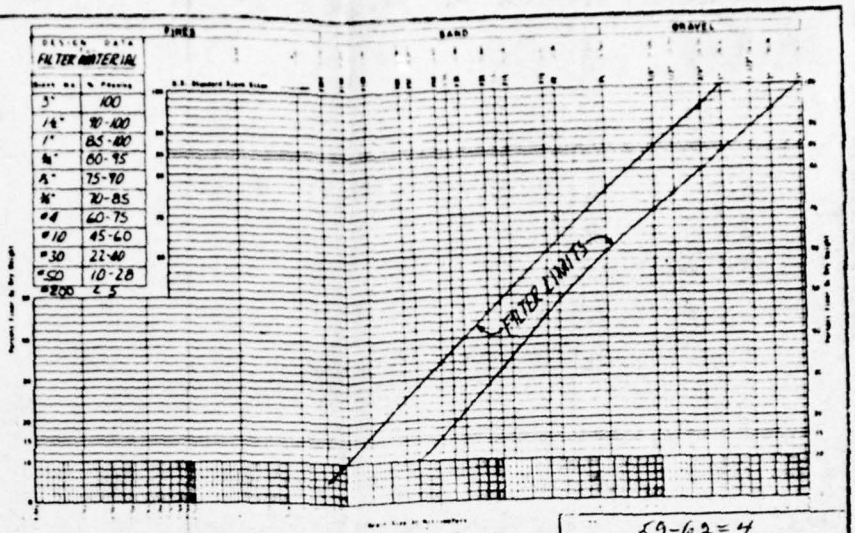
PROFILE ALONG ℄ OF FOUNDATION DRAIN
SCALE: HOR- 1"=20'
VERT- 1"=40'

DATE OF GEOLOGIC INVESTIGATION - SEPT. '61
UNIFIED SOIL CLASSIFICATION BY VISUAL INSPECTION

NOTE: ALL BCCMP IN FOUNDATION DRAIN TO BE 6" DIA 16 GAUGE ANNULAR CORUGATED, WITH STD COUPLING BANDS.

100' OF 6" DIA BCCMP (PERFORATED)



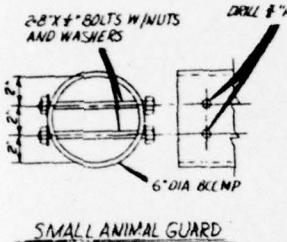


DESIGN DATA FILTER MATERIAL	
Sieve No.	% Passing
3"	100
1½"	90-100
1"	85-100
¾"	60-95
⅜"	75-90
#4	70-85
#10	60-75
#30	45-60
#50	22-40
#200	10-28
	2-5

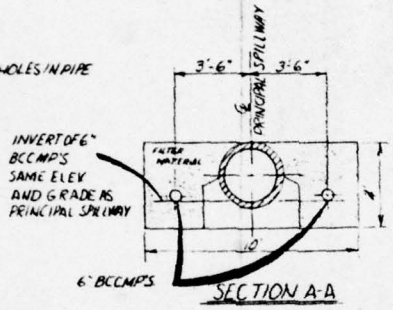
59-62-4
FILE NUMBER

RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD - DEPARTMENT OF FORESTS & WATERS ON THE 30 DAY OF Oct A.D. 1962
Chester H. Crampton

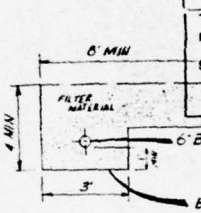
REC'D FOR
SEE REPORT NO.
J. J. Ellam
Div. Dams



SMALL ANIMAL GUARD
2 REQ'D (NOT TO SCALE)

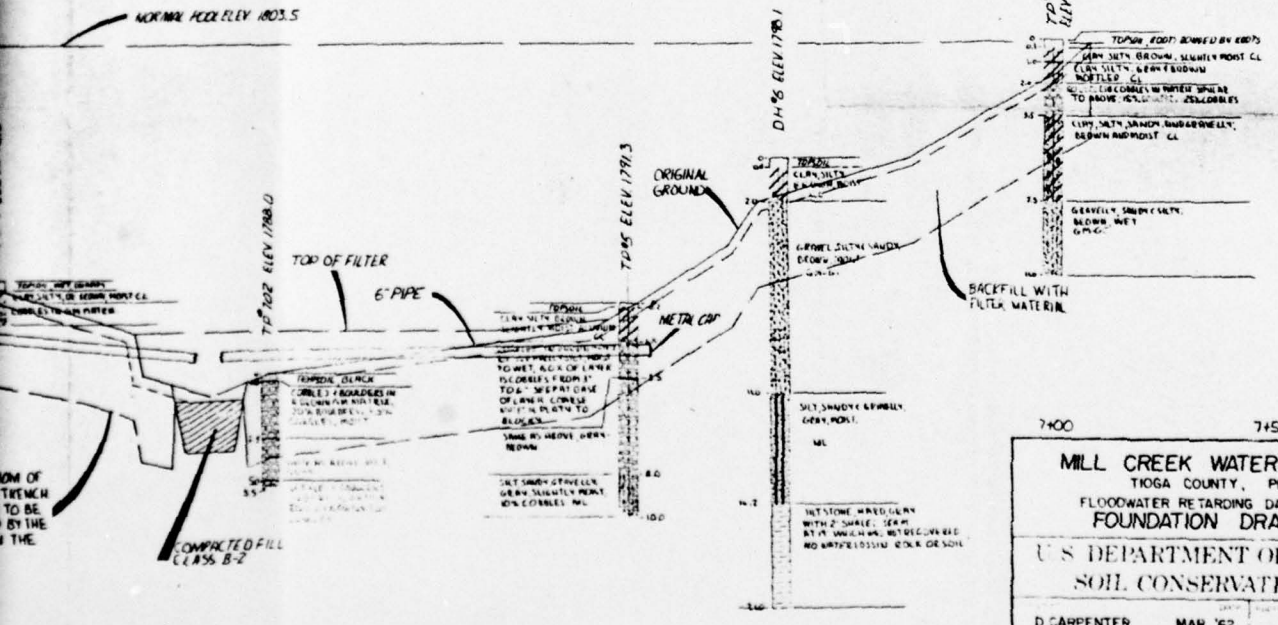


SECTION A-A



SECTION B-B
SECTION C-C SAME AS SECTION B-B EXCEPT 6" PIPE IS OMITTED

5/19/62
C. V. McConnell
Chief Engineer



PROFILE ALONG ℄ OF FOUNDATION DRAIN
SCALE: HOR- 1"=20'
VERT- 1"=10'

5+00 5+50 6+00 6+50 7+00 7+50

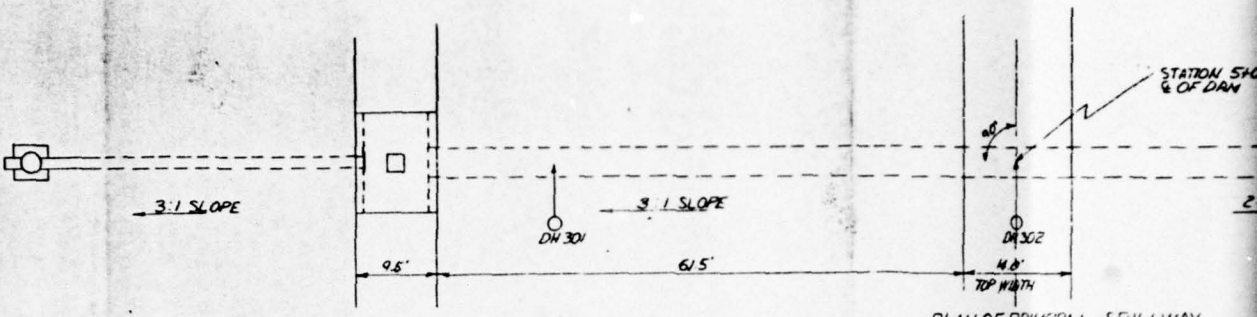
FIGURE 5

MILL CREEK WATERSHED PROJECT
TIOGA COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-455
FOUNDATION DRAIN DETAILS

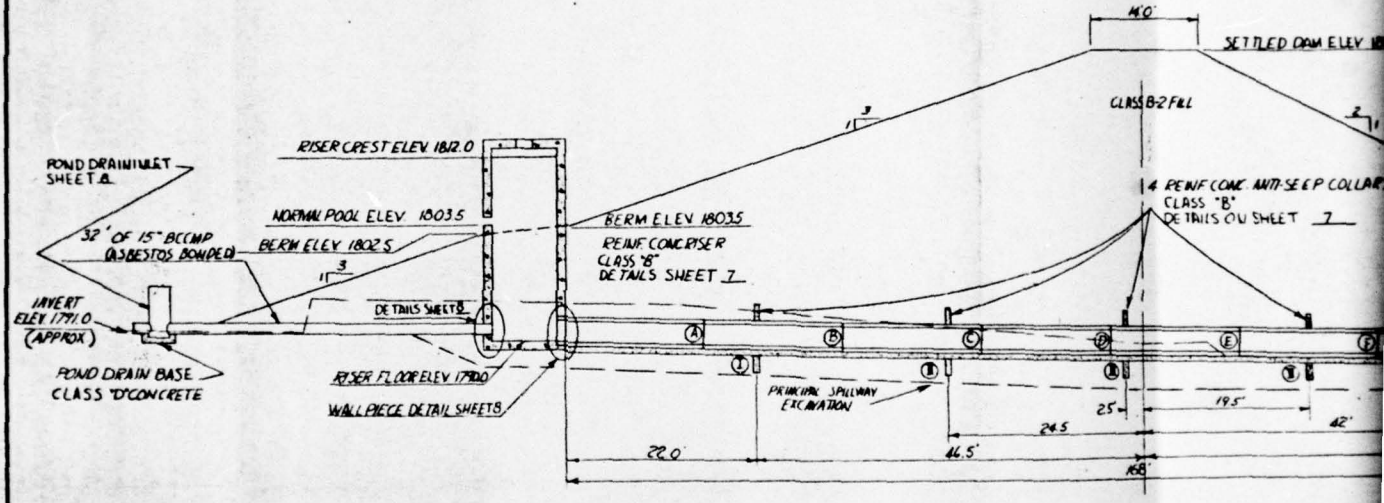
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

D CARPENTER	MAR '62	
R A STALTER	MAR '62	
L WALL	MAR '62	5/9 PA-455-P

2

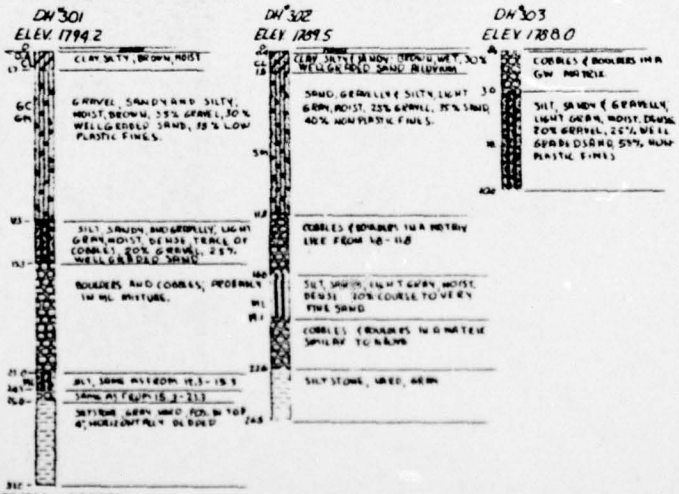


PLAN OF PRINCIPAL SPILLWAY
SCALE 1"=10'

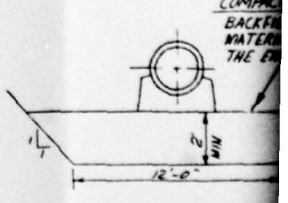


PROFILE OF PRINCIPAL SPILLWAY
SCALE H=1"=10'
V=1"=10'

SOILS DATA



DATE OF GEOLOGIC INVESTIGATION - SEPT '61
UNIFIED SOIL CLASSIFICATIONS BY VISUAL INSPECTION



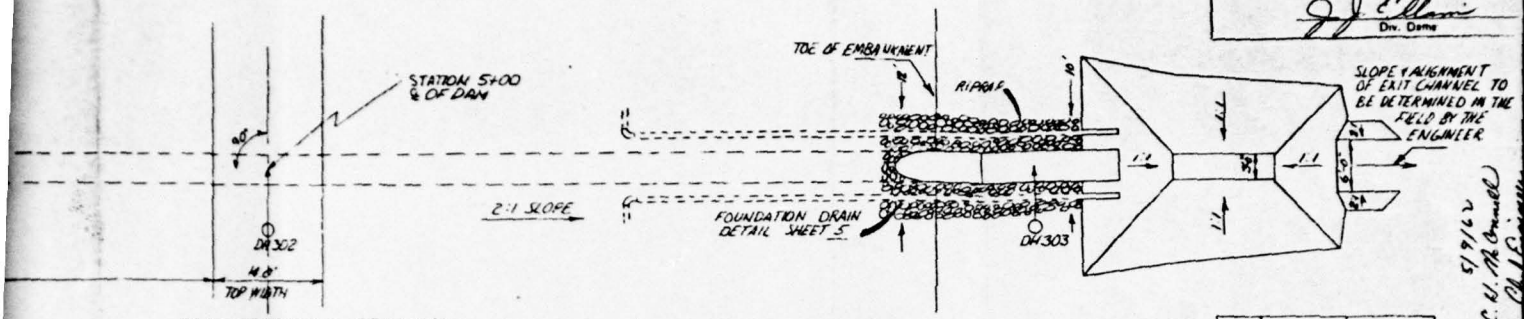
TYPICAL SECTION OF PRINCIPAL
SCALE 1"=5'-0"

59-62-6

RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD - DEPARTMENT OF FORESTS & WATERS ON THE 3 DAY OF Apr AD 19 62
Christine B. Davenport
File Clerk

REC'D _____ FOR _____
SEE REPORT NO. _____
J. J. Ellis
Div. Dams

5/9/62
C.H. McCormick
Chief Engineer



PLAN OF PRINCIPAL SPILLWAY
SCALE 1" = 10'

PRINCIPAL SPILLWAY

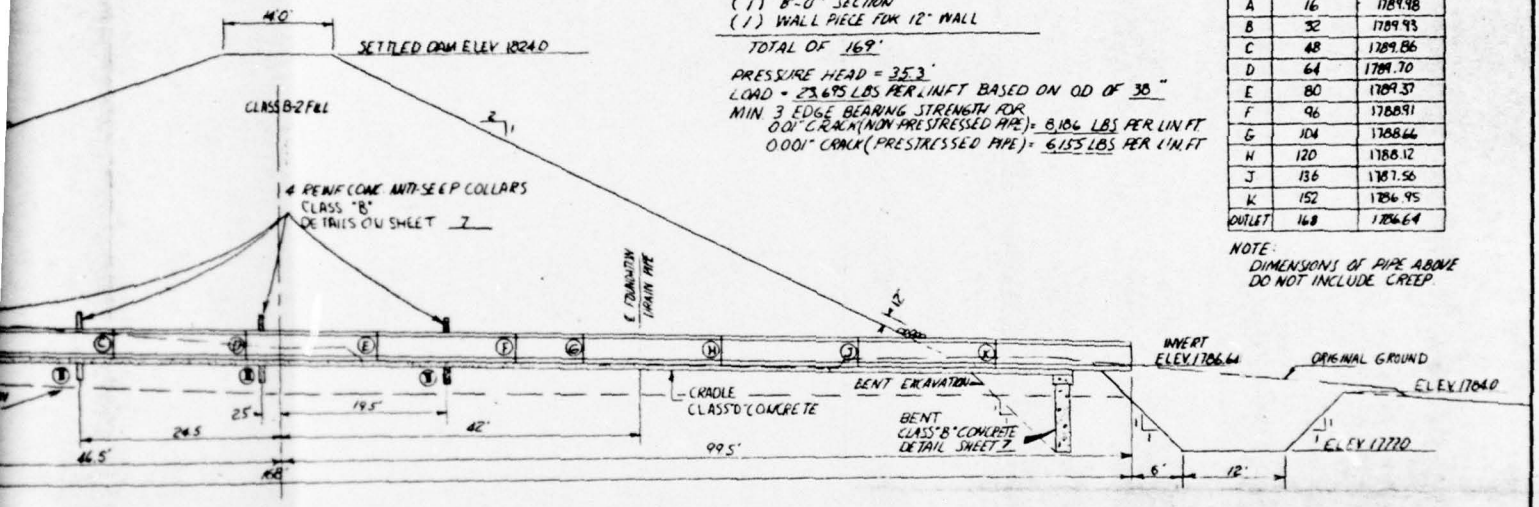
30" ID REINFORCED CONCRETE WATER PIPE
(10) 16'-0" SECTIONS
(1) 8'-0" SECTION
(1) WALL PIECE FOR 12" WALL

TOTAL OF 169'

PRESSURE HEAD = 35.3'
LOAD = 23,695 LBS PER LINFT BASED ON OD OF 38"
MIN 3 EDGE BEARING STRENGTH FOR
0.01" CRACK (NON PRESTRESSED PIPE) = 8,186 LBS PER LIN FT
0.001" CRACK (PRESTRESSED PIPE) = 6,155 LBS PER LIN FT

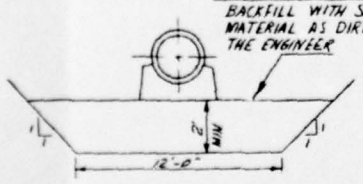
POINT	DISTANCE FROM RISER WALL PIECE	INVERT ELEVATION OF 30" ID WATER PIPE
RISER	0	1790.00
A	16	1789.98
B	32	1789.93
C	48	1789.86
D	64	1789.70
E	80	1789.37
F	96	1788.91
G	104	1788.66
H	120	1788.12
J	136	1787.56
K	152	1786.95
OUTLET	168	1786.64

NOTE:
DIMENSIONS OF PIPE ABOVE DO NOT INCLUDE CREEP.



PROFILE OF PRINCIPAL SPILLWAY
SCALE H: 1" = 10'
V: 1" = 10'

POINT	DISTANCE FROM RISER WALL PIECE	INVERT ELEVATION OF 30" ID WATER PIPE
I	22'	1789.96
II	44	1789.88
III	66'	1789.66
VI	88'	1789.14



TYPICAL SECTION OF PRINCIPAL SPILLWAY EXCAVATION
SCALE 1" = 5'-0"

FIGURE 6

MILL CREEK WATERSHED PROJECT
TIOGA COUNTY, PENNSYLVANIA
FLOODWATER RETARDING STRUCTURE PA-455
PROFILE OF PRINCIPAL SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

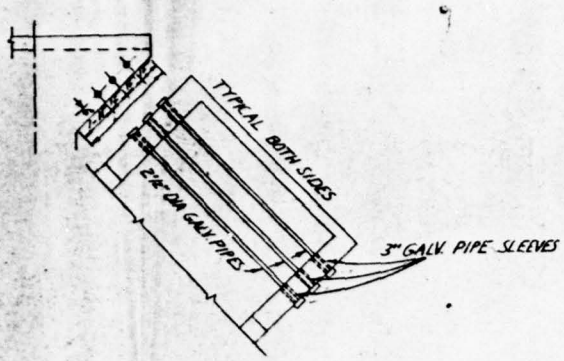
Designed	Date	Approved by
D. CARPENTER	MAR. '62	Title
Drawn		
R.A. STALTER	MAR. '62	Title
Traced		
Checked		Sheet No.
L. WALL	MAR. '62	6 of 9

Drawing No. PA-455-P

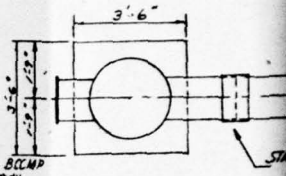
Form SCS 313 (November 1955)

PACK WITH DRY JUTE, OA
MATERIAL APPROVED BY
SEAL WITH COLD APPLI
COMMERCIAL GRADE.
RUBBER GAS
STE
STEEL SPIGOT RING

DETAIL OF REINFORCED
CONCRETE WATER PIPE JOI



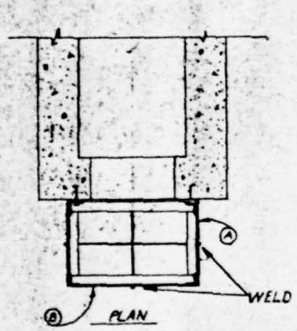
HIGH STAGE TRASH GUARD
(NOT TO SCALE)

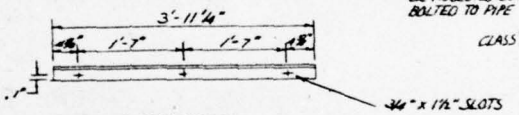


8" OF 30" DIA ASBESTOS BONDED BCCMP PREFABRICATED WITH STUBS AS SHOWN. 30" DIA PIPE TO BE PERFORATED PER ARMCO STANDARD PUNCHING LAYOUT PLATE NO. 1003285 DATED 6-7-48 OR EQUAL.

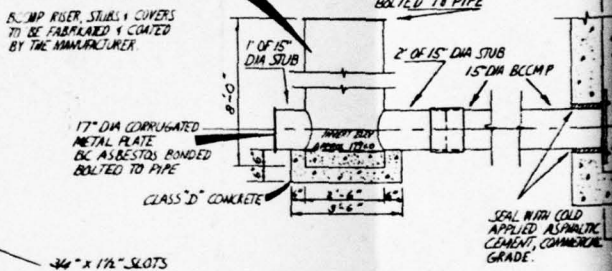
32" DIA CORRUGATED METAL PLATE (BC. ASBESTOS BONDED) BOLTED TO PIPE

BCCMP RISER, STUBS & COVERS TO BE FABRICATED & COATED BY THE MANUFACTURER



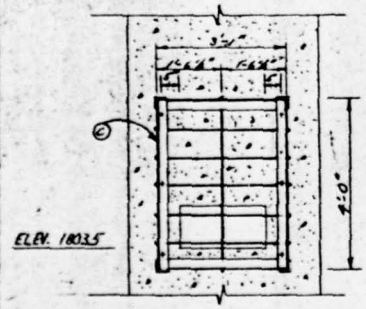


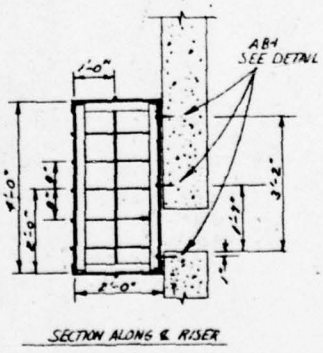
ANGLE IRON C
2 SLOTTED – 2 WITHOUT SLOTS



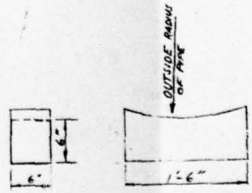
SECTION ON ℄

DETAILS OF POND DRAIN
(NOT TO SCALE)





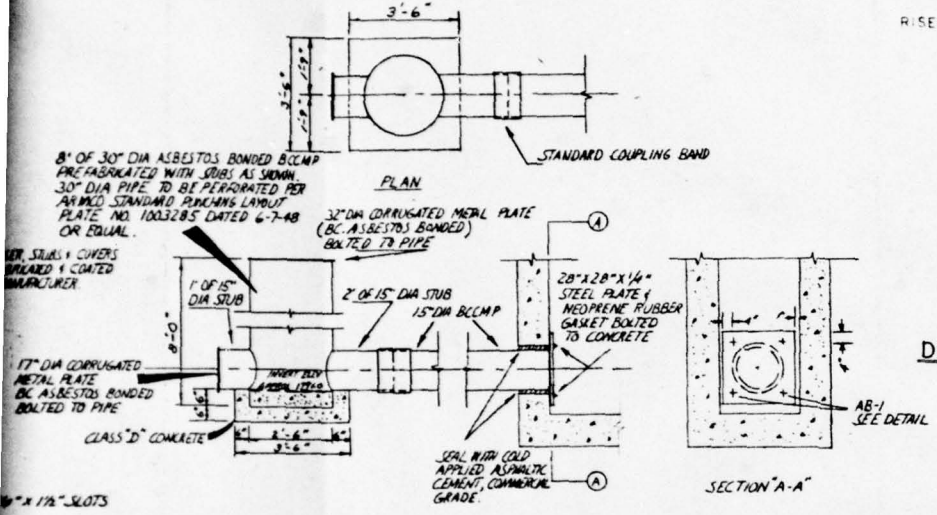
DETAILS OF LOW STAGE TRASH GUARD
(NOT TO SCALE)



SUGGESTED CONCRETE SUPPORT BLOCK FOR CONCRETE PIPE

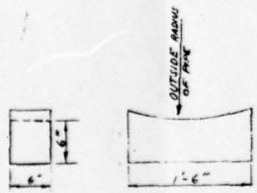
LOCATION
LOW STAGE TRASH GUARD
HIGH STAGE TRASH GUARD
POND DRAIN

DETAIL OF REINFORCED CONCRETE WATER PIPE JOINT

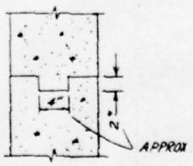


SECTION ON ℄

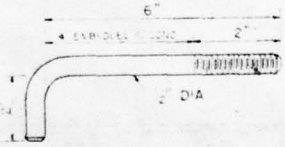
DETAILS OF POND DRAIN
(NOT TO SCALE)



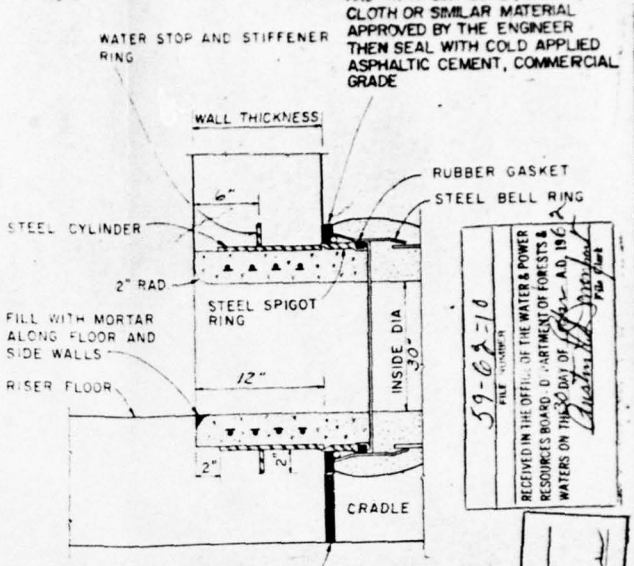
SUGGESTED CONCRETE SUPPORT BLOCK FOR CONCRETE PIPE



TYPICAL CONSTRUCTION JOINT



GALV. ANCHOR BOLT, AB-1



DETAIL OF WALL PIECE IN RISER

59-62-10
FILE NUMBER
RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD, DEPARTMENT OF FORESTS & WATERS ON THIS 30 DAY OF June A.D. 1962
Chief, Div. of Water Rights
File Clerk

RECD FOR
SEE REPORT NO.
Chief, Div. of Water Rights

5/9/62
C. A. McDonald
Chief Engineer

FIGURE 7

BILL OF MATERIAL

LOCATION	ITEM	SIZE	LENGTH	QUANT
LOW STAGE TRASH GUARD	ANGLE IRON "A"	2½"×2½"×¼"	2'-3¼"	4
	ANGLE IRON "B"	2½"×2½"×¼"	3'-0¼"	4
	ANGLE IRON "C"	2½"×2½"×¼"	3'-11¼"	4
	REINFORCING BARS	#4	2'-3¼"	12
	REINFORCING BARS	#4	3'-0¼"	7
	REINFORCING BARS	#4	3'-11¼"	3
	ANCHOR BOLTS (GAL) W/NUTS & WASHERS			6
HIGH STAGE TRASH GUARD	GALV. PIPE STD THREADED ENDS	2½" DIA	9'-9"	6
	GALV. PIPE SLEEVES	3" DIA	1'-0"	12
	GALV. CAPS	2½" DIA		12
POND DRAIN	STEEL PLATE	29"×28"×⅜"		1
	ANCHOR BOLTS (GAL) W/NUTS & WASHERS			4

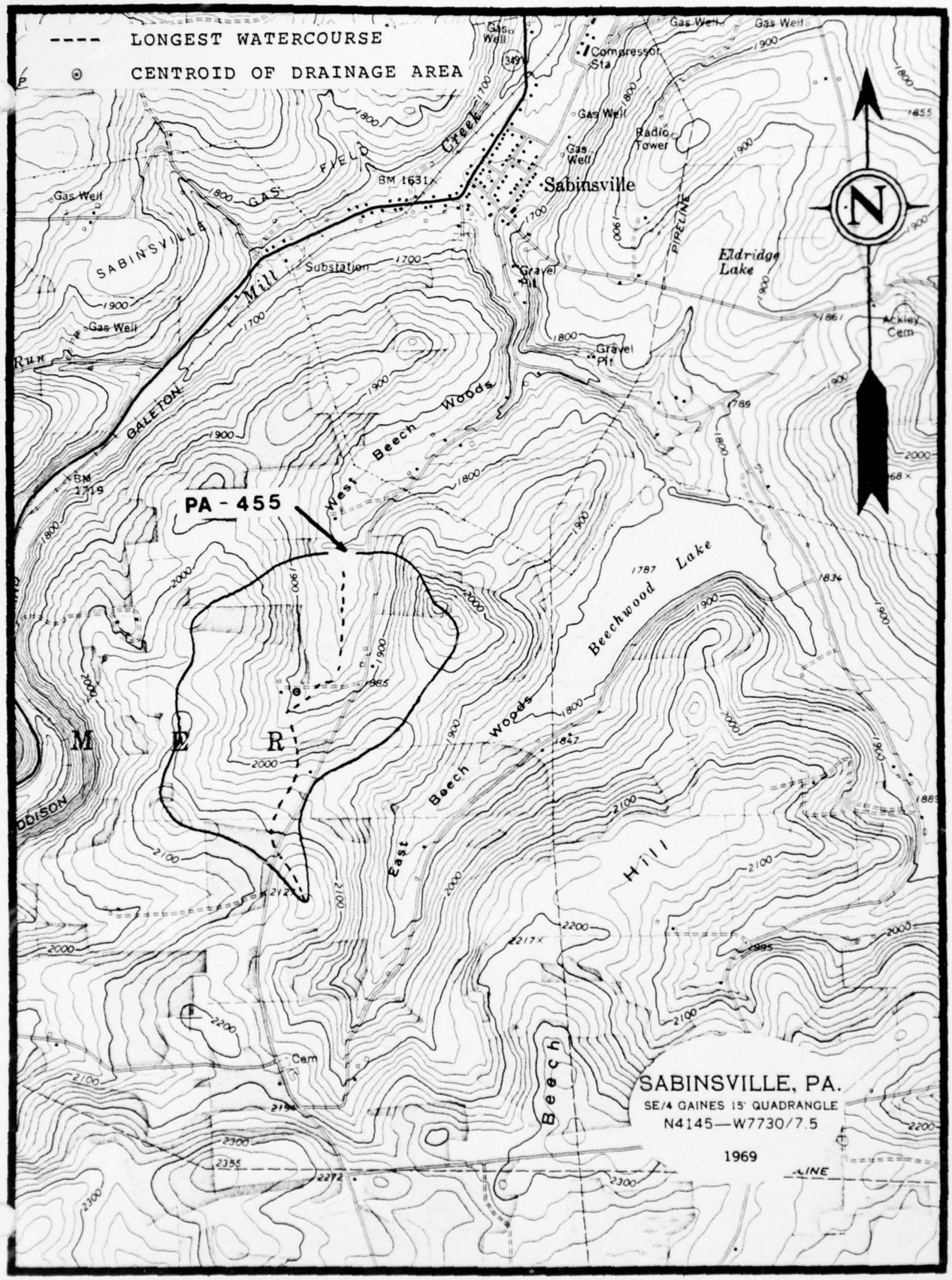
MILL CREEK WATERSHED PROJECT
TIOGA COUNTY, PENNSYLVANIA
FLOODWATER RETARDING DAM PA-455
TRASH GUARDS AND MISC. DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

D. CARPENTER	MAR. '62		
G. VAN BUSKIRK	MAR. '62		
L. WALL	MAR. '62	8 9	PA-455-P

APPENDIX G

REGIONAL VICINITY MAP


---- LONGEST WATERCOURSE
⊙ CENTROID OF DRAINAGE AREA
PA - 455
Sabinsville
Compressor Sta
Radio Tower
Gas Well
Gravel Pit
Substation
Eldridge Lake
Ackley Cem
Cem
Mill Run
GALETON
SABINSVILLE
GAS FIELD
PIPELINE
West Beech Woods
East Beech Woods
Beechwood Lake
Beech Hill
BM 1631
BM 1719
SABINSVILLE, PA.
SE/4 GAINES 15' QUADRANGLE
N4145—W7730/7.5
1969